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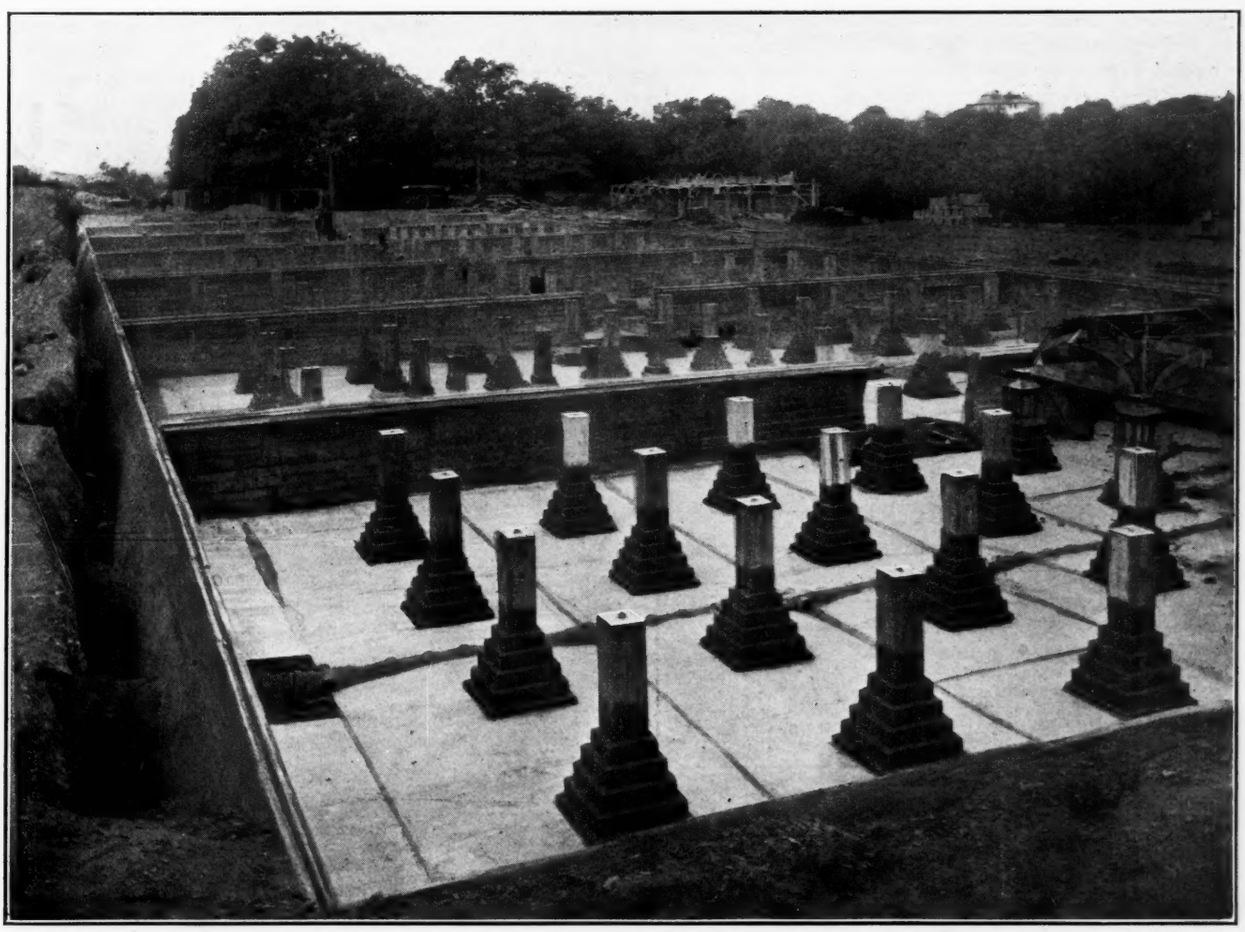


GENERAL VIEW OF BERNHART FILTERS—CONTROL HOUSE IN BACKGROUND

READING WATER WORKS IMPROVEMENTS

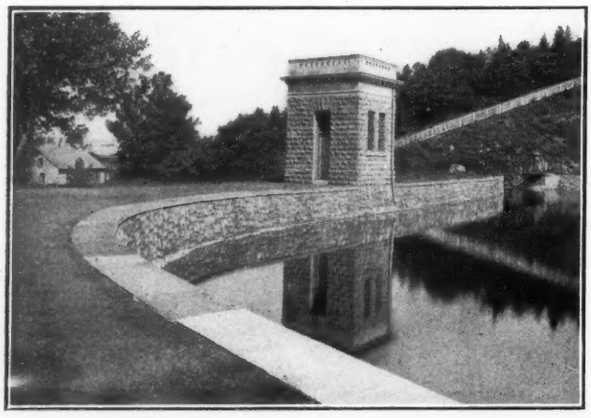
Two Sand Filtration Plants—Concrete Arch and Flat Roofs for Reservoirs — Skating Rink on Reservoir Roof —Producer Gas Pumping Plant—Details of Bernhart Filter and Buttonwood Reservoir Construction

IN no other city of the country, probably, is there a greater amount of interesting and instructive filter and reservoir construction work now going on than in Reading, Pa. This city of about 100,000 population is situated on the side of a hill and in the valley at its foot and contains such variations in elevation as to require three distribution systems—high, intermediate and low. There is one distributing reservoir for the high service, with an elevation of 630.84; one for the intermediate service with an elevation of 445.0, and one for the low service with an elevation of 345.0. Thus the difference in elevation between the high and low service is nearly 300 feet.

The high service is supplied from the Egelman storage reservoir, which is separated from the city by a high mountain. The capacity of this reservoir is 6,990,000 gallons and its elevation 680.0. The drainage area is 0.6 square mile. This source furnished a little over 2 per cent of the consumption last year. Although the consumption on this service is not large, the supply is subject to serious reduction by droughts, and a pumping station is now being provided for raising water from the intermediate to the high service reservoir in case of necessity.

Three sources supply the intermediate service. The greater

amount and, in fact, over one-half of the entire supply of the city is drawn from Maiden Creek, a fair-sized stream about eight miles from the city, and pumped to the intermediate reservoir. It occasionally becomes necessary to supply the low service from this source also, although during the year covered by the last report only about 56,000,000 gallons was pumped to the low service. The drainage area of Maiden Creek is 210 square miles and the elevation of the creek at the pumping plant 240.0 feet. The other sources of supply for the intermediate service are Antietam Lake and Hampden Springs and Drift. Antietam Lake has a storage capacity of 101,000,000 gallons and a drainage area of 5.44 square miles. The elevation is 510.2. Hampden Drift is a tunnel about six feet high and three or four feet wide carried for 200 feet into the mountain and lined with timber. About a year ago a line of open-joint sewer pipe was laid through the drift and surrounded with broken stone, as the timbering of the drift was found to be rotting. The water from the springs and tunnel is collected in Hampden reservoir, which serves as the distributing reservoir for the intermediate service and has a capacity of 29,180,000 gallons and an elevation of 445.0. The springs and drift furnished less than 1 per cent of the total consumption last year. The low service is supplied chiefly from Bernhart Creek, a small stream about three miles north of the city, with a drainage area of 2.56 square miles above the dam and a storage reservoir with a capacity of 42,000,000 gallons and an elevation of 385.31, from which reservoir the water flows by gravity to the low service distributing reservoir.



GATE HOUSE, BERNHART RESERVOIR

Of these supplies the high service or Egelman supply is filtered in two open sand beds, each 40 by 55 feet, and having a capacity of 250,000 gallons per day. These went into service in 1903. Of the intermediate service supplies the Antietam Lake water is filtered in three open sand beds, each 108 by 144 feet and having a capacity of 1,750,000 gallons per day. These filters have been in service since 1905. The Hampden Spring and Drift supply is not filtered, nor is that from Maiden Creek. The Bernhart Creek water of the low service also is not at present filtered.

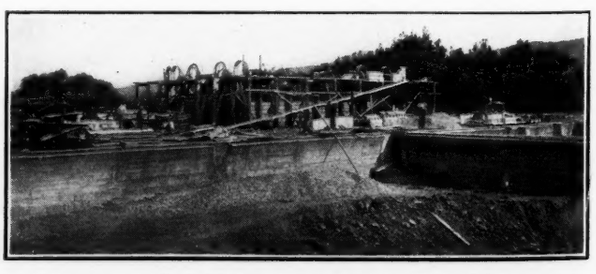
There has been more or less indication that some of the unfiltered water has been the cause of typhoid fever. In the latter part of 1908 there was an epidemic in which 600 persons were striken with the disease, most of whom were found to be consumers of the Maiden Creek supply. Under instructions of the State Board of Health this supply was treated with copper sulphate and this treatment has been continued up to the present time at the rate of about one part to three and a half or four million of water. This was considered as a temporary experiment, however, and it was decided to filter this supply and also the Bernhart supply. This will provide slow sand filtration for the entire supply of the city except the small portion coming from the springs and drift, which feed the Hampden reservoir, and which is not subject to contamination. This work is now under way, six filter beds being provided for the Bernhart supply and ten for the Maiden Creek supply. Both of these filters are to be covered. In connection with the Maiden Creek supply a concrete dam has been built and a reinforced concrete conduit one and a half miles long to bring the water from this dam to the filters. The filters are adjacent to the existing pumping station and the water flows by gravity to the filters and from the filters to the pumps.

In addition to the dam, conduit and two sets of filters the department is placing concrete roofs over both the Penn street (low service) and Buttonwood street (high service) distributing reservoirs; also the Buttonwood street reservoir is being repaired and rendered water tight, it having leaked badly ever since construction. One of the interesting features of this latter work is the covering of Penn street reservoir. This reservoir is very near the heart of the city and is surrounded by a beautifully kept park planted with shrubbery, flower gardens, etc. The reservoir was enclosed with an iron fence, but thoughtless persons have been continually polluting the water by throwing into it paper, cigar stumps and various matters, and in a number of ways it has been found to be so treated as to make it desirable to entirely roof over the reservoir. In addition there has been some trouble with algæ. Instead of merely covering this roof with sod and walks, as might have been done, the department decided to utilize the roof as a skating rink. Accordingly the entire area will be covered with a smooth concrete surface which will be used for roller skating in the summer, and a six-inch concrete curb surrounding this will permit flooding it so that it can be used for ice skating in winter. In the center of the area is being erected a pavilion which will be provided with seats. There has also just been completed a pumping plant for raising water from the intermediate to the high service, as explained above. This is a producer gas plant in two complete units of 50 horsepower each, enclosed in a stone building. A new stable, storage yard and shop are nearing completion, the last containing a meter-testing laboratory. A chemical and bacterial laboratory has for some time been in service in the office building of the department.

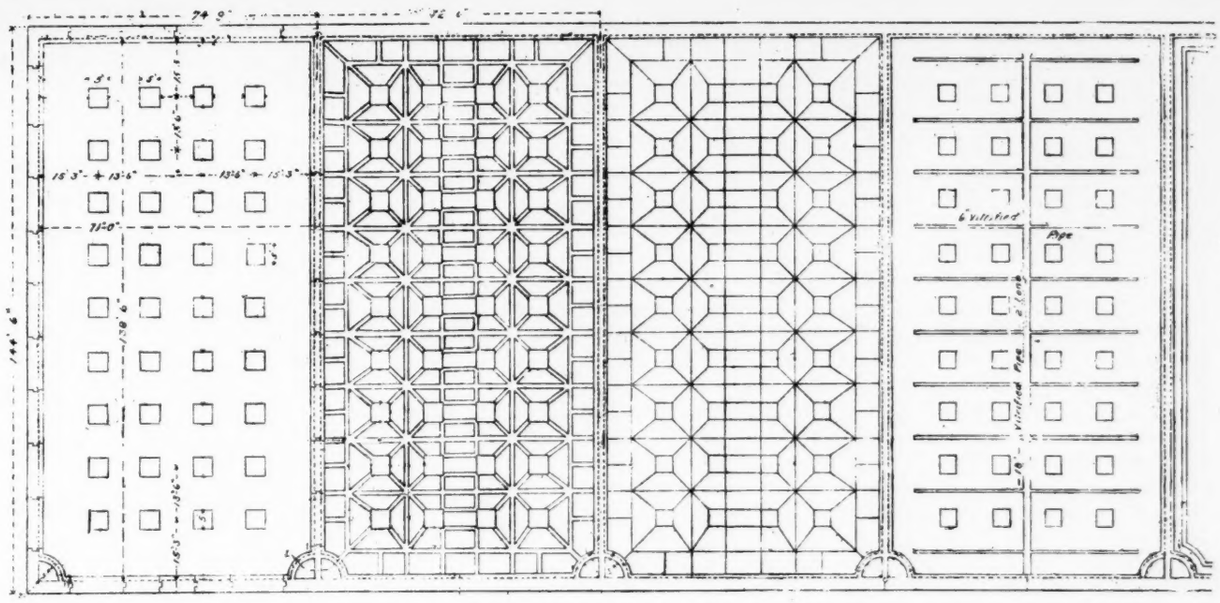
In connection with these main features there are a number of details, some unique and a number instructive. In this issue we will describe two of these pieces of work and will give descriptions of the others in later issues.

Bernhart Sand Filters

Filters for purifying the Bernhart supply are located on a side hill about three miles from the city, the elevation of water on the filters being 376.0. The elevation of the waste weir of the Bernhart reservoir being 385.3, the water reaches the filters by gravity, and the effluent from the filter plant will flow by gravity to distributing reservoirs at Penn street, the water in which has an elevation of 345. In reaching this reservoir, however, the water will flow through the distribution system, the reservoir serving as an equalizer and falling during the time of high consumption and filling again at night. There are now being constructed six slow sand filters, each 71 by 138½ feet inside dimensions, covered with groined arches supported by square pillars and outside and partition walls, all of concrete. There is a filter control house at one side of filter No. 5, in which will be, in addition to the control room and the gate chamber in the basement, a tool room and an engine and pump room, the pump room being required to supply the wash water.



WALL OF FILTER NO. 6; CONTROL HOUSE IN BACKGROUND

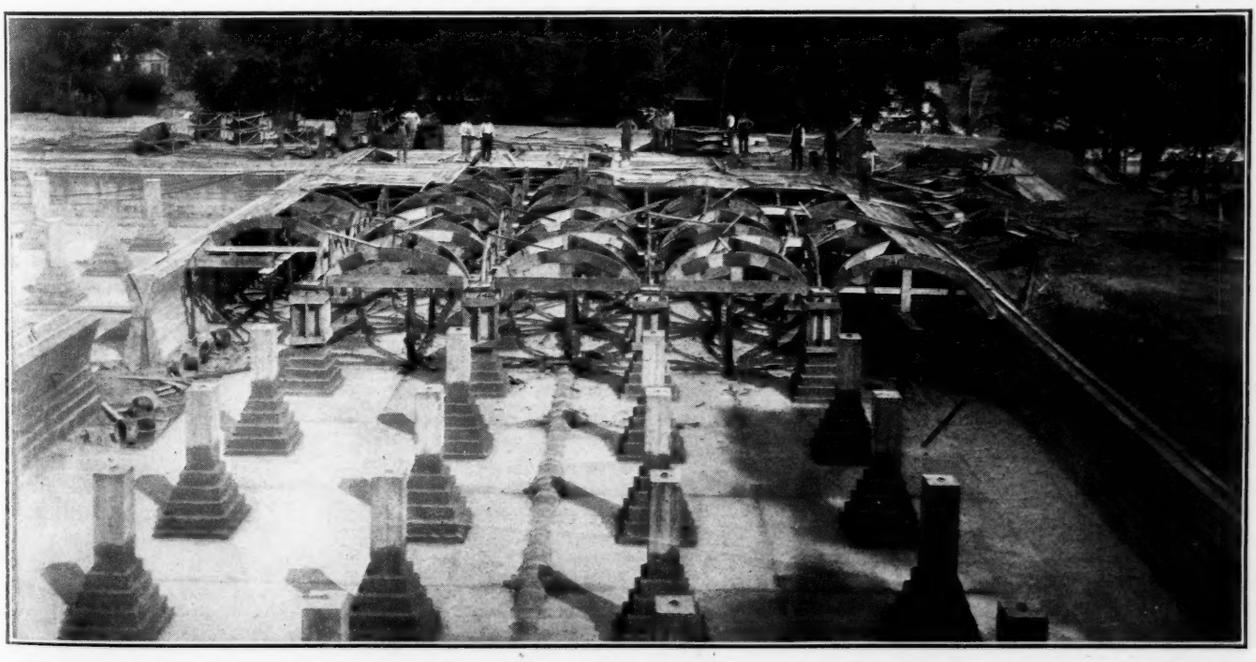


NO. 1.—PLAN OF FOUNDATIONS NO. 2.—PLAN OF FLOOR BLOCKS NO. 3.—PLAN OF FLOOR SLABS NO. 4.—PLAN OF UNDERDRAINAGE SYSTEM

PLAN OF FILTERS NOS. 1 TO 4

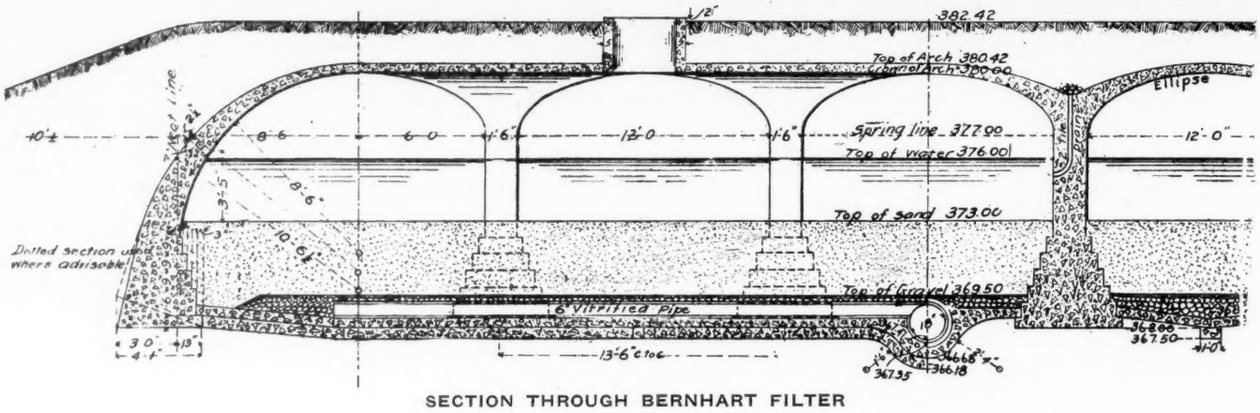
The most noticeable feature in connection with these filters is that the floors are not constructed in the form of inverted groined arches, such as have practically become the standard for covered filter and reservoir construction during the past few years, but are composed of flat slabs constructed alternately, so that the separate slabs may contract and expand. The general shape of most of the slabs is a trapezoid, a few being rectangles. These slabs rest upon what are known as floor blocks, which are strips of concrete about a foot wide and six inches thick, so located that six inches of each edge of each slab shall rest upon a floor block, except that one edge of most of the slabs rests upon the bottom step of the footing of the piers. The bottom step and the top surfaces of all floor blocks are covered to the thickness of about one-sixteenth inch with an asphaltum mixture which will not become hard at freezing temperature. The ground between the floor blocks and pier footings is graded to a plane for each slab and the floor slabs are made in place, five inches thick, and smoothed off on top to a sidewalk finish. This gives the floor the general form of a series of intersecting flat troughs rather than intersecting inverted arches, as is more common. This, it is thought, will insure somewhat better drainage of water to the underdrains. The principal object, however, is to permit the floor slabs to expand or contract without causing any leakage, it being believed that the soft asphaltum which is placed under six inches of every edge of each slab will prevent any leakage of water under the slabs, however wide the joint between slabs may open. This construction has been adopted also in the other filters which the city has under way.

There are some other features of construction which are out of the ordinary. The arches are for the most part elliptical, but from the crown of the arch next to each outside and partition wall over to such wall the arch is a quadrant of a circle, this bringing the springing line down to the top of the footing, which is four feet lower than the springing line of the elliptical arches, the object of this being to carry the thrust



BERNHART FILTER, SHOWING SANDED PIERS, FORMS AND CENTERING IN PLACE, AND WORKING PLATFORMS

Section of Wall Omitted at Left for Removing Forms



SECTION THROUGH BERNHART FILTER

down to the foundation rather than to rely upon the back-filling for resisting it. (This idea was employed in the Columbus, O., filters.) The radius of the circular arch is 8 feet 6 inches. The elliptical arches have a span of 12 feet and a rise of 3 feet. The arch is 5 inches thick at the crown and about 1 foot at the spring line.

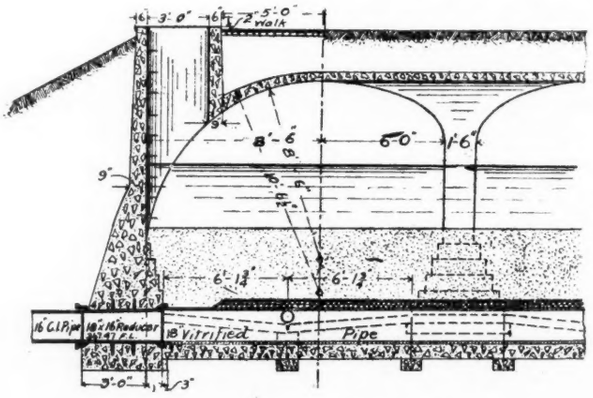
The concrete piers are all stepped out to form a footing 5 feet square, the pier itself being 18 inches square. This stepped footing extends up to within 6 inches of the sand surface. The object of this is both to distribute the load over a larger area and to introduce angles which will prevent the water from following the pier surface to the under drains rather than passing through the sand. This method of constructing footings has been employed with brick piers, but is believed to be novel in the construction of concrete piers.

All concrete work, including floor slabs and pier and wall footings, are sanded and waterproofed throughout up to the water level. This is done as follows: After filling all voids with neat cement, the surface is moistened and washed with thin, neat cement, followed immediately by dashing clean sand against the washed surface. After the cement has set the surfaces are brushed and any spots not covered are again treated. Afterward and after all cementing and other work likely to introduce dirt in the filters have been completed, the filters are cleaned and scrubbed, if necessary, and when perfectly clean and dry are washed with a solution of three-fourths pound of Olean soap to a gallon of water, applied by hand at boiling temperature. About twenty-four hours later a solution of one-half pound of powdered alum to four gallons of water is applied; and these two solutions are applied alternately at twenty-four-hour intervals until three of each have been applied.

The depressions between arches on the outside top of the filter, where water would collect, are drained by 2-inch vitrified pipes built vertically in the center of each pier for about five feet down from the top, at which point they turn horizontally and discharge through the face of the pier. (Superintendent Nuebling believes that this is unnecessary and that in future work he would simply place a short pipe running diagonally from such depression through the arch.) Over the top of this drain pipe is placed a perforated plate and above this graded broken stone is placed by hand. The tops of the arches are covered with earth to a minimum depth of two feet, which will be sodded at the completion of the contract.

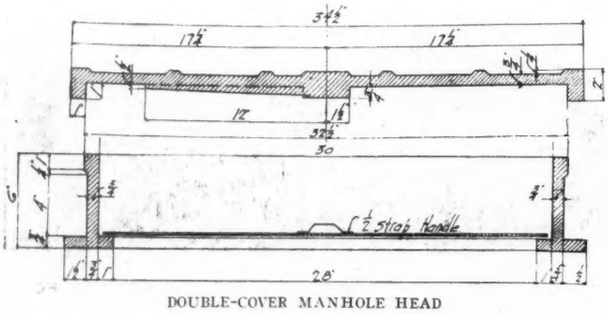
There are eleven openings in the top of each filter to furnish light and ventilation, one of these, at the side wall, serving also as a manhole and being provided with iron steps set into the concrete. There are built into the under side of the roof of the filter a number of sockets from which can be suspended incandescent lamps and wiring, although it is doubtful whether these will be used, as the openings furnish sufficient daylight.

In each partition wall are set horizontal steel T's projecting about ten inches, on which to rest a line of water pipe for bringing wash water to the filter, and here also may be placed discharge pipes for carrying the dirty sand to outside sand washers should this method of sand removal be adopted. It is proposed, however, to use Nichol's sand washers, in which case the sand will be washed in the filter itself and only the pipe for supplying the water will be needed. One such pipe serves two filters, connections being carried through the partition walls at intervals.



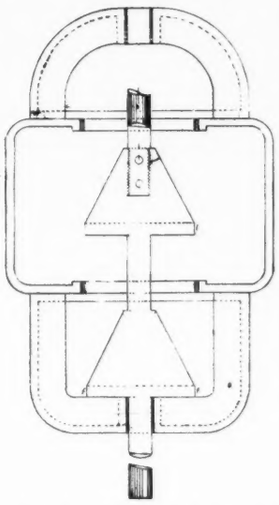
SECTION THROUGH SIDE ARCH AND MANHOLE

In one corner of each bed is a well enclosed by a wall in the form of a circular quadrant having an inside radius of five feet, over the top surface of which the entering raw water will be discharged onto the beds. The top of this wall is level with the sand surface and the top foot or two is composed of bricks laid dry so that, should the level of the sand bed be lowered by cleaning or settlement, one or more courses of brick may be removed so that the wall may be kept level with the surface of the bed and prevent wash of the sand by the falling of water from it, as would occur if the wall were above the sand. At the corner nearest to this is another small well through which the wash water escapes. This is constructed in the same way as the other, but just inside the wall is suspended a baffle wall extending nearly to the bottom, and over the outlet opening will be placed a hood opening upward, over whose top edge the water must flow in escaping, the object of this being to cause the well to serve as a silt basin and catch the sand which might otherwise be washed out into the drain.



DOUBLE-COVER MANHOLE HEAD

Each filter inlet is controlled by a balanced float valve bolted to the 10-inch inlet pipe. A copper float, cylindrical in form, 24 inches in diameter and 15 inches high, is fastened to a vertical stem which extends into the valve casing and carries on its lower end two conical gates which rise into an upper and lower opening in the valve casing, the conical shape reducing the discharge area slowly as the water in the filter approaches the predetermined level.



SECTION THROUGH FLOAT VALVE
Diameter of valve, 6 31/32 inches; of opening, 7 inches

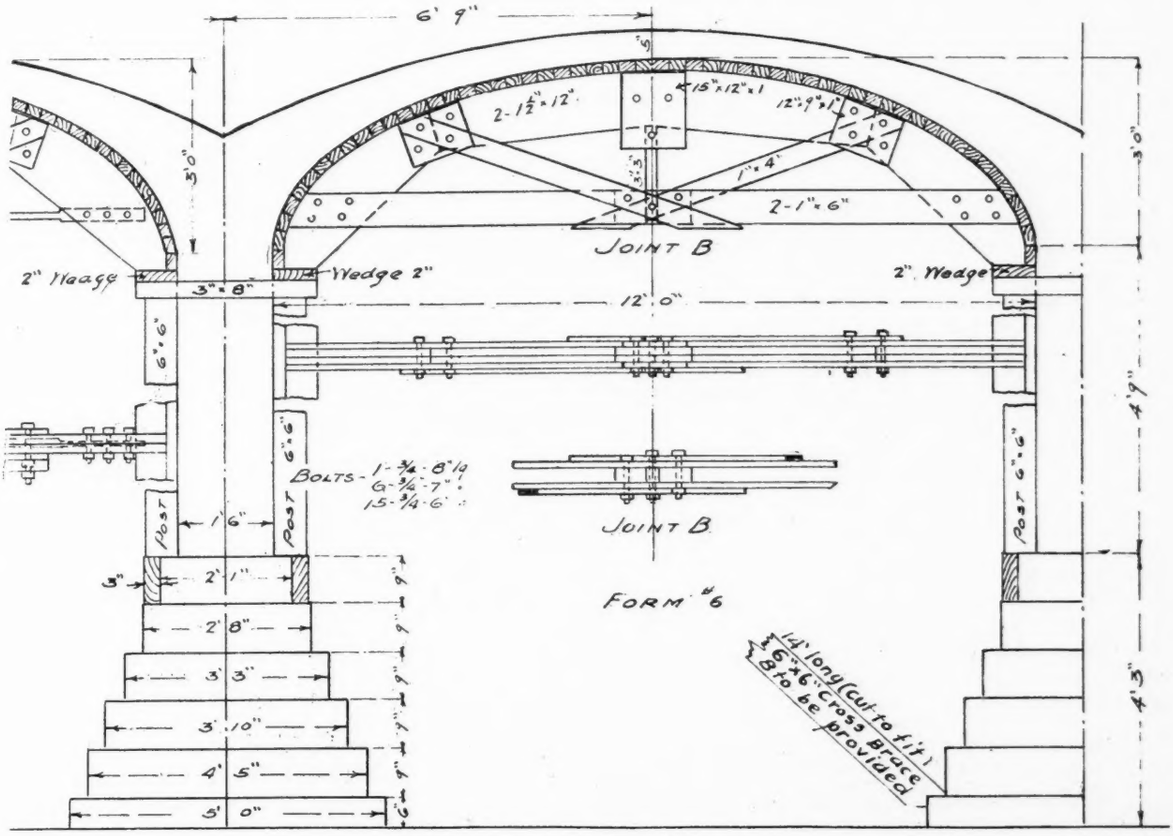
All pipes which pass through the walls of the filter are provided with two flanges about one-half inch thick and extending six inches or more at right angles to the body of the pipe, which are embedded in the concrete, the object of these being to prevent leakage by water flowing between the concrete and the outside of the pipe.

All concrete is mixed in the proportion of one cement, two sand and four broken stone. Lehigh cement was used in the construction in this work, and, in fact, in all of the work now going on for the department, except the raw water conduit. This cement is tested as received in carload lots and has uniformly exceeded the requirements, although these are quite rigid. In order to avoid any possible collapse of the roof arches, such as occurred in Lawrence, Mass., it is required that the centering for one entire filter be in place before any concreting is begun. In order that the centering forms might be used over again they were designed, as shown on one of the accompanying plans, so as to be bolted together, and

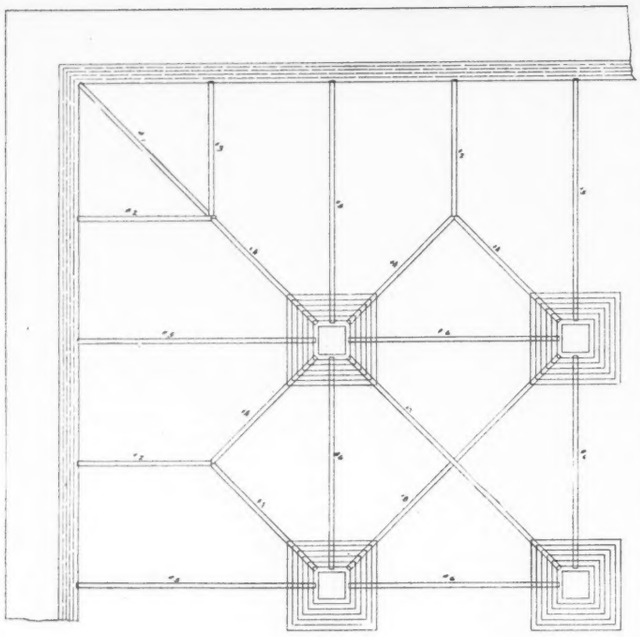
BEGINNING FILTER CONSTRUCTION, STONE CRUSHER AND CONCRETE MIXER AT WORK

knocked down and removed through the manhole openings of each filter after the roof was entirely completed. The contractor, however, suggested and received permission for a modification of this plan, leaving out one section of the partition wall and a corresponding section of arch, through which opening the forms can be carried into the next filter without being taken apart. Consequently the forms used by the contractor were simpler than those shown in the plans. Those shown, however, were used at the Maiden Creek filters.

On these forms two-inch lagging is placed and covered with builders' paper to prevent the adhering of the lagging to the concrete. The centers are supported midway between piers by posts resting upon the floor. At the piers the centers are supported by posts resting upon the top projection of the footing courses. In removing the centers these posts are first knocked out. The lagging, which has been nailed lightly to the forms, remains in place to a certain extent and the forms are pried loose from the lagging, which is removed afterward. The use of builders' paper was not perfectly satisfactory, as the paper wrinkled more or less during the placing of the concrete and furthermore the nap from the surface adhered to the concrete, giving a reddish and uneven surface. This detracts nothing from the strength, but is unsightly. In the later work a heavier oiled paper was used and was found



DETAILS OF FORM FOR ROOF ARCHES



ARRANGEMENT OF FORMS FOR CENTERING

more satisfactory. In the other filter and reservoir construction the lagging is oiled with a heavy crude oil, which seems to be more satisfactory than the use of paper. The walls are built in alternate sections, a groove being left in the end of each section for making a bond with the succeeding one. These grooves are in general one-third as wide as the thickness of the wall and one-half as deep as wide. A similar tongue and groove joint is made between the top of the side walls and the arches springing therefrom. No such joints, however, are made between sections of arch construction.

The under drainage system consists of a main drain 18 inches in diameter laid through the longest axis of each filter, from and at right angles to which are carried 6-inch underdrains midway between each two lines of columns. The 18-inch pipe is laid with cemented joints, but the 6-inch are laid with open joints; one side of the bell of each pipe being cut away before burning so that the body of the pipe may rest upon the floor. The pipes are laid with about three-quarters inch between barrels in the socket and the joints are surrounded with broken stone placed by hand to the amount of about one cubic foot per joint.

After the laying of underdrains, broken stone is laid to a maximum depth of 12½ inches, the lower 8 inches of which is 1 to 2-inch stone, the next 2½ inches are between ⅜ inch and 1-inch stone, the next 1½ inches between ⅛ and ⅜-inch stone, the next ½ inch between 1/16-inch and ⅛-inch stone, and above this is ½ inch of coarse sand between 1/32 and 1/16 inch. This broken stone does not cover the entire bottom, but stops about two feet short of the walls of each filter. Above this is placed the filter sand, deposited in four layers, each about ten inches thick. This sand has not yet been placed, as the filters are not yet completed and ready for it. The sand will be furnished by the city, but placed by the contractor. It is specified that the sand must not be dropped from a height or otherwise unduly compacted.

The sand will be obtained from Jersey Shore, a contract having been let for the same at $1.05 per net ton f.o.b. Reading. It is specified that the sand shall be clean, washed river sand or bank sand, free from foreign substances and screened to the required sizes.

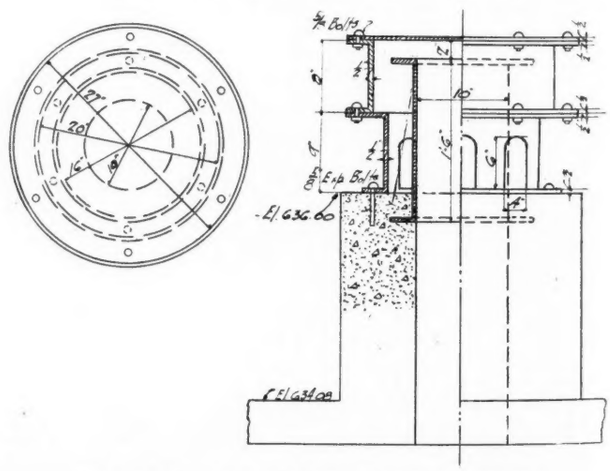
The grains of sand shall be of hard material which will not disintegrate, and shall be of the following diameters:—Not more than one per cent., by weight, shall be smaller than 0.13 mm; 10 per cent., by weight, shall not be smaller than 0.24 mm. nor larger than 0.31 mm.; 60 per cent., by weight, shall not be larger than 0.63 mm.; and 85 per cent. shall not be larger than 1.00 mm. No grains shall be larger than 5.00 mm. The diameter of sand grains shall be computed as the diameters of spheres of equal volumes. The sand shall not contain more than one per cent. of lime and magnesia soluble in dilute hydrochloric acid in 24 hours at 70 degrees Fahrenheit, taken together and calculated as carbonates. The sand, when mixed with distilled water and thoroughly agitated, shall not show a greater turbidity than 2500 parts per million, one minute after agitation.

The filter was excavated in a clayey material which overlies limestone rock. This rock is more or less filled with seams, some of which result in settlements in the clay. In the Bernhart filter such a settlement appeared where a pier foundation was to be constructed, a hole opening which was approximately circular and six feet in diameter. To meet this difficulty the hole was filled with earth well rammed and the earth domed up to a spherical surface about 18 inches below the underside of the concrete. The earth around the settlement was excavated in a continuation of the same spherical surface for about two feet all around, and over this was placed about a foot of concrete, which thus became a domed arch resting upon the firm soil around the edges of the settlement. It is expected that this will be capable of supporting the weight of the pier which rests upon it.

The more important prices for this work are as follows: 42,500 cubic yards of excavation (including rock, should there be any), 60 cents per cubic yard; 4,800 cubic yards of concrete masonry at $4.48 per cubic yard, not including the cement, which is furnished by the department, but including the placing of pipes in the walls, washing with asphaltum and waterproofing solution, giving sand finish, etc.; 1,350 cubic yards of broken stone and coarse sand in bottom of filter, $1.70 per cubic yard, which includes both furnishing and placing. Laying, hauling and placing filter sand (which is furnished by the department), 45 cents per cubic yard. Eighteen-inch vitrified pipe laid as described, 82 cents per foot; 3,240 feet of 6-inch underdrains laid as described, 12 cents per linear foot. The contractors were Albrecht & Leader. Mr. Paul D. Kauffman is the resident engineer in charge. The plans were prepared and the work is under the general supervision of Superintendent Nuebling.

Buttonwood Street Reservoir

In 1894 there was built upon the hillside east of the city a distributing reservoir for the high service supply, known as the Buttonwood street reservoir. This had a capacity of 1,022,000 gallons and a water surface elevation of 630.84. The hillside here was very steep and a large part of one side of the embankment was in fill, while the outer portion of the embankment was continued, with several bermes, a considerable distance down the hill. The reservoir was lined with concrete. Soon after beginning to fill the reservoir there were slips in the embankment which caused breaks in the concrete lining and very considerable leaks, so that it became impossible to completely fill the reservoir. It is stated that the concrete used in the lining was so porous that water passed through it read-



VENTILATOR FOR BUTTONWOOD STREET RESERVOIR

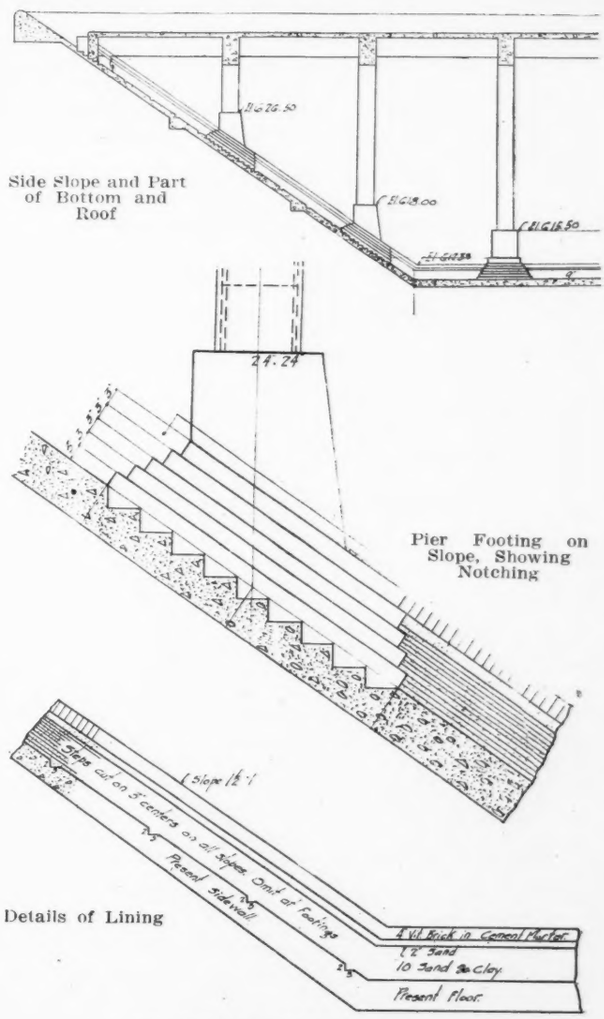
Impossible for solid matters to fall or be thrown into reservoir through ventilator

BUTTONWOOD STREET RESERVOIR, SHOWING BREAKS IN CONCRETE LINING

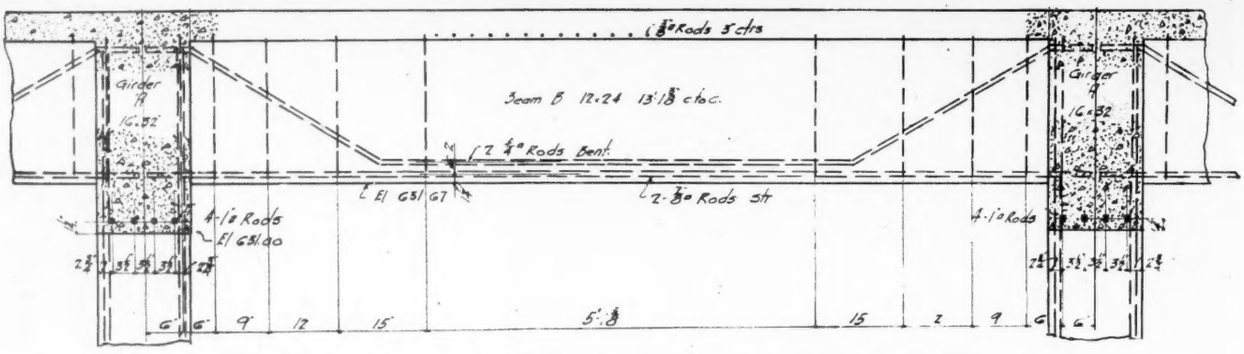
ily, and this was probably responsible to a considerable extent for the settling of the embankments. Soon after this an effort was made to put the reservoir into serviceable condition by filling the cracks in the concrete and painting the entire inner surface with asphalt; but this did not result in a tight reservoir. Some time later another effort was made by cutting out all loose material from the various cracks in the concrete and filling these with rich concrete, or with mortar where the cracks were narrow. This also failed to prevent leakage. The necessity for the reservoir has been increasing, however, and a determined effort is again being made to render it tight. This work is now almost completed and the reservoir will probably be filled in a few weeks.

The work just done consisted in puddling the interior of the reservoir, on top of the concrete, with clay and sand mixed 1 to 1 and thoroughly rammed to a thickness of 10 inches in two 5-inch layers. On this is spread 2 inches of sand, and upon the sand is laid 4 inches of brick work with cement mortar joints. The object of the brick work is merely to protect the sand from wash. The main object of the sand is to furnish a material which will readily wash into any cracks which may form in the puddle and thus assist in stopping leakage. The reservoir is covered with a flat concrete roof resting on beams and girders, which in turn are supported by piers. The footing of the piers rests upon the old concrete lining, the lining having been notched into approximately level steps to prevent the pier footings from sliding. The piers have a maximum height of 22 feet. The roof, 5 inches thick, is supported by girders and beams of concrete, the span of each being about 12 feet, the girders being 16 by 32 inches and the beams 12 by 24 inches. The girders, beams, and roof slabs are reinforced as shown upon the plans. All concrete was mixed 1:2:4.

The reservoir was first thoroughly cleaned out by scrubbing and all cracks in the concrete lining were filled with a 1 to 1 cement ground poured into them. The pier footings and piers were then constructed, and following the roof beams and slab. The outside of the roof slab was water-proofed with the soap and alum solution used in the Bernhart filters. The reinforcement used was "new style" square corrugated bars of the Corrugated Bar Company, of St. Louis, Mo.

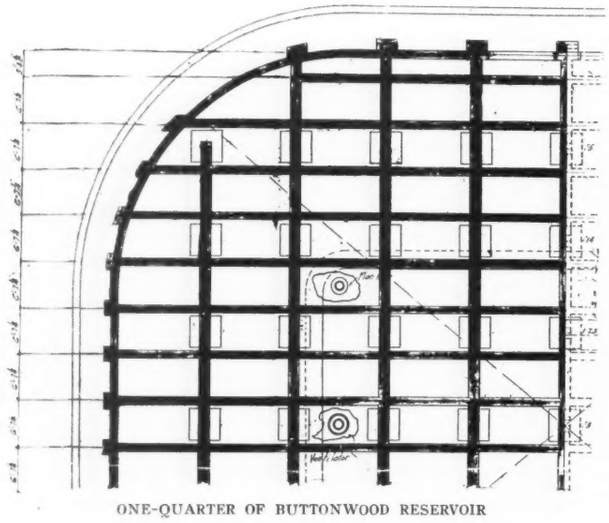


BUTTONWOOD RESERVOIR SECTIONS



ONE SPAN OF BEAM AND SECTIONS OF GIRDERS, SHOWING REINFORCEMENT

After the concrete work had been completed the puddle was placed. This was made by placing on a mixing board and breaking it into fine particles, then adding the sand and turning the two over and over, with sufficient water added, until the mass was thoroughly mixed. It was then tamped in two 5-inch layers and the top surface trimmed to true lines and grades and kept moist until the sand lining was placed. The brick lining was made with hard-burned shale brick, made by the Hamburg Vitrified Brick Company. In the roof of the reservoir were placed 148 2-inch drainage holes which were covered with metal screens, over each of which was placed two cubic feet of broken stone in sizes graduated down to ⅛-inch stone, and around each was placed 3 cubic feet of sand. The whole was then covered with earth to a depth of about 2 feet. This earth will be graded and sodded. The puddle, brick, etc., placed as a lining in this reservoir will reduce its capacity to about 900,000 gallons.



ONE-QUARTER OF BUTTONWOOD RESERVOIR

Showing Arrangement of Beams and Girders

The principal items of this contract were as follows: Cleaning and grouting the old lining, $181.00; notching for pier foundations, $4.74 per cubic foot; 645 cubic feet of reinforced concrete masonry, $5.51 (not including cement); 1 200 barrels of Portland cement, $1.33; 74,300 pounds of steel reinforcement, 2.7 cts.; 420 cubic yards of clay and sand puddle lining, $1.63; 85 cubic yards of sand lining, $1.90; 1,525 square yards of brick lining, $1.42. The total estimated amount of the contract was $13,691.75. The engineer in charge of this work was E. K. Cortright, who also has charge of the storage-yard improvements and covering the Penn street reservoir.

The works described above, and the others to be described in later issues, will make the Reading plant a most up-to-date and efficient one. The credit for this is due to the progressive Board of Water Commissioners, and especially to its superintendent and engineer, Emil L. Nuebling, who has held this position continuously for exactly fifteen years.

BLEACHING POWDER STERILIZATION

Its Use at Ridgewood, Midland Park, Boonton and Little Falls, N. J., Newport, R. I. Omaha, Neb., and Montreal, Canada

Bleach, for the continuous sterilization or disinfection of a public water supply, was first put into operation at Boonton, N. J., Sept. 26, 1908. It was used as a temporary expedient during a typhoid fever epidemic due to an infected water supply, at Maidstone, England, in 1897, for the sterilization of reservoirs, pipes and filters. A solution of hypochlorite of soda was used temporarily to sterilize or disinfect the water supply of Lincoln, England, during a typhoid epidemic in 1904-5. Electrolytic solutions of sodium hypochlorites have been used several times, as temporary expedients, for the same purpose. The reasons for use of the process at Boonton, as well as the methods, were described in the issue of Municipal Journal and Engineer for July 7, 1909. Extensive experiments were made with the use of bleach in the early nineties by Traube, Lode, Sickenberger, Kaufmann, Bassenge, Hunermann, Deiter and Ballner, to obtain practically instantaneous sterilization or disinfection of water for the use of travelers or use in the field. Their results, although not successful in attaining the results sought, were successful in establishing the efficiency of bleach as a disinfectant of water.

The use of bleaching powder in water purification was introduced in the Boonton supply by Dr. J. L. Leal, and during the past year he has advised and assisted in its use by a number of other cities. We are indebted to him for information concerning several of these instances, which are briefly described below.

Bergen Aqueduct Company

The plant of this company is situated at Midland Park, N. J., the supply being derived from wells 150 to 200 feet deep. This company supplies water to Ridgewood and Midland Park, the total daily pumpage averaging about 700,000 gallons. Recently the supply became contaminated by sewage from a large mill which reached one of the wells and thereby rendered dangerous the entire supply. A disinfecting plant was installed and put in operation during the latter part of November, 1909, and has been in constant use since that time. The amount applied has been kept at about 0.2 part per million of available chlorine continuously, except for a certain period when 0.3 part per million were used. There has at no time been any taste or odor noticeable in the water due to the bleaching, except for a few hours one day when the pumpage was diminished without the knowledge of the attendant, which caused the rate to be highly increased. The result of this increased rate, the amount of which was not known, was that for a few hours there was a taste and odor in the general supply, these continuing for two or three days in the dead ends of the system.

The water of this supply is comparatively low in organic matter and originally averaged only four or five bacteria per c.c., with no B. coli. After contamination with sewage the count rose to from 200 to 400, and B. coli were present in 0.1 c.c.

Since the application of bleach was begun the highest count has been 6, and B. coli have been found (by presumptive test) only once in 10 c.c.

Little Falls, N. J.

Bleach has been used at Little Falls intermittently since November, 1908, but the apparatus there was crude and the results, satisfactory from a bacterial standpoint, were not so from a mechanical one. A proper disinfection plant is now being installed to be used in connection with the mechanical plant. The bleach will be added to the raw water main about 500 feet from the filtration plant. The sulphate of alumina solution is added as the raw water enters the coagulation basin of the filtration plant. There will be another connection by which bleach can be added to the filtered water just before it reaches the pumps. It is the intention to use about 0.3 parts per million of available chlorine.

Newport, R. I.

Dr. Leal is installing at Newport, R. I., a combined aeration, settling, filtration and disinfecting plant, this being the first plant in the country originally constructed with a view to using both filtration and disinfection to the best advantage. This plant consists of four elements: First, the aerators; second, settling basins; third, coagulation basin; fourth, mechanical filters. Its daily capacity will be 7,500,000 gallons. It is so arranged that bleach may be applied to the water at any of several points—before aeration, as the aerated and settled water enters the coagulation basin, as coagulated water reaches the filters, or to the filtered water. It is expected that this plant will begin operation about the last of April or the first of May.

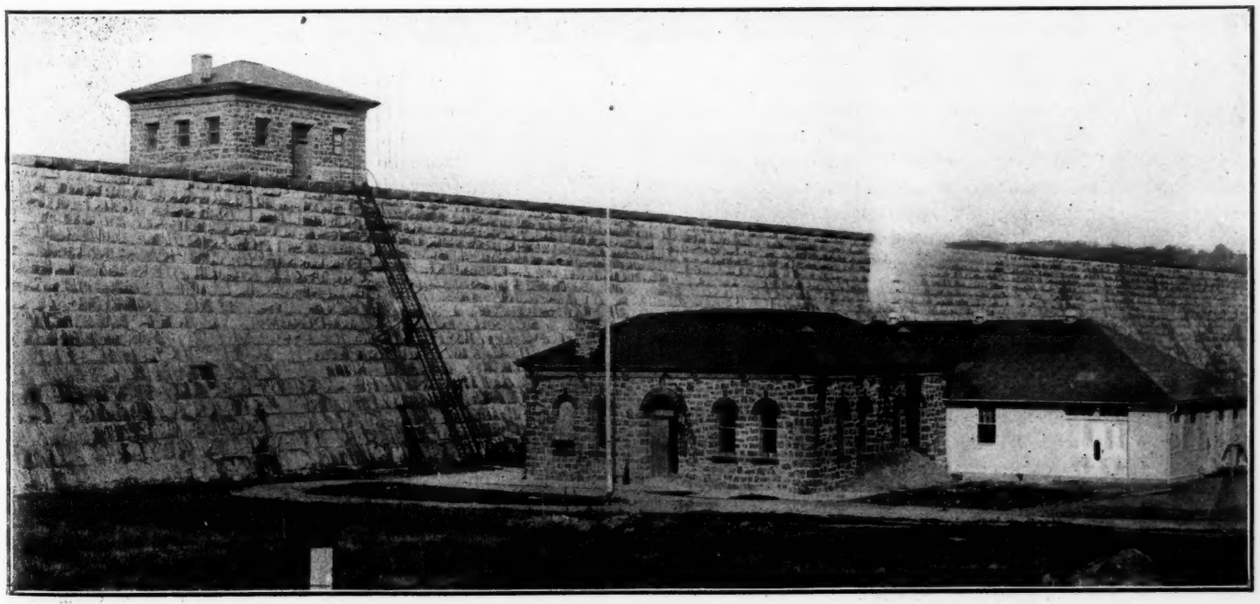
Omaha, Neb.

There is now in course of construction at Omaha, Neb., a plant for treating with bleach the public supply, which is furnished by the Omaha Water Company. It is expected that this plant will be in operation by April 25. The introduction of the use there was due to an unusual prevalence of typhoid fever the early part of this year. The supply is derived from the Missouri River at two intakes, one at Florence, about 2½ miles above the city, and the other at Burt Street, within the city limits. At the former are seven settling basins with an aggregate capacity of about 79,000,000 gallons. Here the water is treated with sulphate of alumina before entering the basins, in order to increase the sedimentation, this coagulant being added at the weirs which discharge the contents of basins one and two into the next of the series, the idea being that basins one and two would receive the heavier materials and thereby allow a more efficient coagulation by the sulphate of alumina. At the Burt Street station there are five basins with an aggregate capacity of 27,000,000 gallons. There, also, sulphate of alumina is used. The records of the Health Department show that the water delivered here is of a better character than that pumped at the Florence station, although between the two there is added to the river the drainage and some of the sewage of the city.

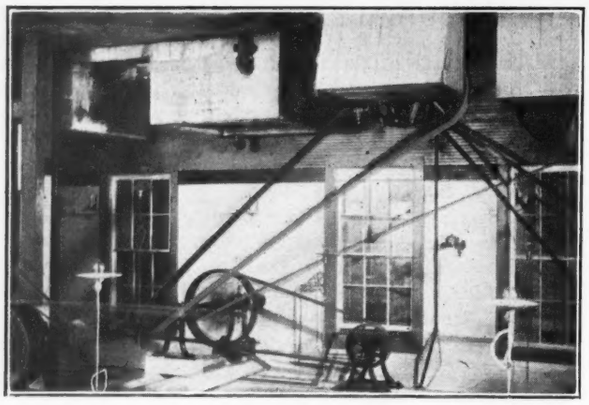
Dr. Leal considered, however, that the amount of sewage discharge above the city was so small and the dilution in the Missouri River so great that the occurrence of typhoid epidemics originating in its use would be very improbable. However, he recommended disinfection on the general principle that all river water should in some way have its bacterial contents removed. The water delivered to Omaha is rendered satisfactorily clear by the sedimentation which it receives, which makes filtration, with its accompanying expense, unnecessary for this purpose, although bacteria removal is desirable. He estimated that the approximate cost for installing a disinfecting plant in Omaha, exclusive of buildings, should not exceed $5,000 at the outside, and that the buildings need cost very little, as only frame sheds would be required.

Boonton, N. J.

Dr. Leal is sanitary adviser to the East Jersey Water Company, which operates the plant at Little Falls, above referred to; to the Passaic Water Company and others, including the Jersey City Water Supply Company, which supplies Jersey City with water impounded by the Boonton, N. J. dam. This last has been previously described by us, and was the first in this country, as stated at the opening of this article. Concerning the results at Boonton during the past year, Dr. Leal states that at the present time the company is using 0.3 part per million available chlorine, which is undoubtedly as high as it will be ever necessary to go. Daily examinations have been made by either Mr. McLaughlin, of Jersey City, or Professor Park, of New York, and at times by both. The combined analyses of both these gentlemen show B. coli as having been found four times in the disinfected water at Jersey City. The report for March, giving the complete analysis as taken at the Boonton dam, only about three-quarters of a mile below the plant, shows the average amount of water treated per day as 40,100,000; the amount of hypochlorite of lime applied as 10.7 pounds per million gallons, having varied from 9.1 to 12.1; or, expressed in grains per gallon, an average of 0.075. This is equivalent to 0.4 part per million of available chlorine, the minimum having been 0.35 and the maximum 0.43. The bacteria per c.c. in the raw water at the dam averaged 5,800,000, having varied between a minimum of 850 and a maximum of 10,500. The treated water below the dam contained an average of 58, having varied from a minimum



UPPER AND LOWER GATE HOUSES AND DISINFECTION PLANT, BOONTON DAM



ORIFICE TANKS, BOONTON DISINFECTION PLANT

of 0 to a maximum of 210. Presumptive tests for coli communis were made on both raw and treated water, with the result that in the raw water a positive result was obtained once and doubtful results 9 times, both in 0.1 c.c.; while in 1 c.c. 7 tests were positive and 13 doubtful. Of the tests on treated water, none of the 1.0 c.c. tests were positive, and of the 10 c.c. tests only one was positive.

HARTFORD, CONN.

Dr. Leal, at the request of the Board of Water Commissioners of Hartford, Conn., investigated the practicability of disinfecting Connecticut River water, which is used by that city, tests having been carried out under the supervision of the Engineer of the Board, Mr. Erman M. Peck, and Prof. James A. Newlands, of the State Board of Health, the experimental work having been conducted by Mr. Harold C. Stevens, who is connected with the New York Board of Water Supply, and was released for this purpose by Mr. J. Waldo Smith, Chief Engineer of that Board. These experiments, which were carried on from December 19 to December 30, reduced the bacterial counts from a minimum of 8,000 and a maximum of 59,000 in the river water, to a maximum of 1,800 and a minimum of one in the treated water, the counts in the treated water having exceeded 100 on three days only.

MONTREAL, CANADA

The city of Montreal, Canada, has been using bleaching powder for treating its supply of about 16,000,000 gallons per day since January 24 of this year, this being considered as a temporary expedient only, which will probably be discontinued upon the completion of the filtration system which is now under construction. Water from the river enters a suction well, from which it is withdrawn from four suction pipes, and the hypochlorite is applied in this well. The equipment consists of two small wooden mixing tanks, from which the solution is discharged into two larger solution tanks immediately beneath. From the solution tanks the solution flows through a rubber hose to a "constant level" tank which is suspended in the suction well. From this tank a second hose carries the liquid to a grid placed directly over the end of the inlet pipe. The bleaching powder is mixed with water to a thick paste in the mixing tanks and then diluted, after which it flows into the solution tanks, where is it further diluted to the required strength. The tanks are in duplicate, and the paste is mixed and diluted in one mixing tank while the other is in service, each unit holding one day's supply. In order to vary the amount of solution applied in proportion to the amount of water pumped, the small tank referred to as the "constant level" tank is suspended in the suction well by a cord, by which it is raised or lowered, thus varying the head upon the grid and consequently the amount discharged. The grid consists of a horizontal and four vertical pipes, all connected together and containing a number of small holes uniformly distributed, through which the disinfecting solution is discharged at a considerable number of points directly into the raw water as it enters through the inlet pipe, the object of this being to effect as thorough distribution as possible. The amount of hypochlorite added is about 0.8 part per million, averaging 37 per cent available chlorine. This plant was installed under the direction of J. O. Meadows, Sanitary Engineer of the Provincial Board of Health. The supply is furnished to the city by the Montreal Water & Power Company.

OZONE STERILIZATION OF WATER

Different Forms of Apparatus Used—Principles of Action—Effects of Temperature and Humidity—French Experiments—American Experiments—Cost of a Two-and-a-Half Million Gallon Plant

By CLIFFORD D. MEEKER

THE synthetic form of oxygen, known as ozone, produced by the action of electrical effluvia, was first established as a result of the pioneer researches in the laboratories of Schonbein, Marignac, Fremy and Becquerel. The discovery of ozone itself is probably to be credited to Von Marum about 1785. In 1836 Arthur William Wright, an American physicist, discovered a new apparatus for the production of ozone and carried on several consistently successful experiments of the effect of ozone upon alcohol and ether. In 1860 Andrew and Tail demonstrated beyond a doubt that ozone was an allotropic form of oxygen rather than condensed oxygen and in 1839 the first chemical uses of O^3 were presented by Schonbein at his laboratory at Basle.

It is perhaps to Berthelot, the great French chemist, that we owe the initial start that was made toward the commercialization of this gas, but it is only within the last 25 years that the advance in science and mechanics has enabled us to place ozone on a strictly commercial scale. This advance was due primarily to the fact that electricity is now widely distributed and produced for a very small sum of money.

Ozone is not produced by electrical means alone, but is found in its normal state in the elements of the atmosphere and in very variable quantities. In portions of the earth where human habitations are infrequent, ozone exists in commensurable quantities in the vicinities of great bodies of water or large areas of forest growth and it has been proven by Henriet and Bonnyssey that the proportion beween the disappearance of ozone in the atmosphere and increase of carbonic acid in the air follow regular laws.

The odor of ozone is detectable even when the gas is present in the atmosphere in exceedingly limited quantities. It is sufficiently strong, however, to be recognizable in the early dawn and immediately after electrical storms. The natural purification of air and of water traveling over rocks is probably partly due to the action of ozone which is developed by evaporation from the surfaces of waters.

The value of the gas has a wide range both in industrial and therapeutic fields, and the present century has developed a system of manufacturing this gas to a commercial point at which the utilization of ozone is practicable; but even as far back as the time of Berthelot its valuable bleaching and deodorizing characteristics were evident and that scientist predicted that in case it could be brought down to a commercial scale it would bring about a positive revolution in the methods of chemical industry.

Figures 1 and 2 show the relative productions of 1890 to 1909. The electrical production of ozone is now considered the most efficient means of producing this gas in commercial

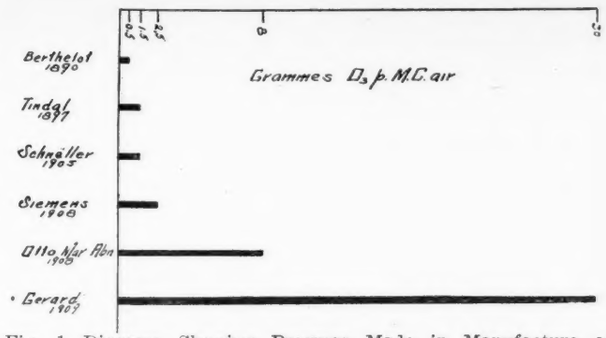


Fig. 1—Diagram Showing Progress Made in Manufacture of Ozone, 1890 to 1909

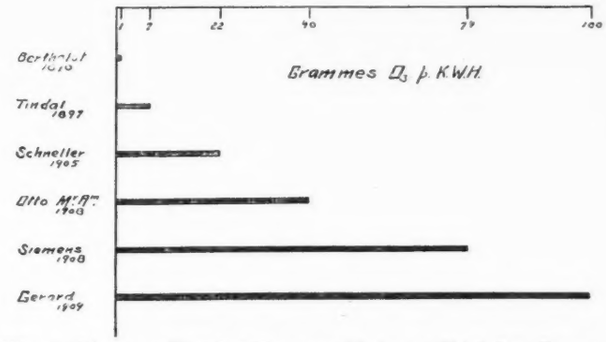


Fig. 2—Diagram Showing Progress Made in Obtaining Concentrations in the Manufacture of Ozone

quantities, although the work of the pioneers in the production of ozone by obtaining the gas from exposing phosphorus to humid atmosphere laid no small foundation for the present method.

The method of production of ozone electrically can perhaps be divided into three heads: The first class of methods being that which produces ozone by the emission of streamers or sparks from pointed electrodes to pointed electrodes or flat surfaces; the second being the discharge from flat surfaces of metallic electrodes, and the third being the silent discharge that takes place between induced potentials from the smooth surface of dielectrics, whether these dielectrics be curved or flat.

The first system of generators of ozone was a result from the experience found in laboratories and established the fact that ozone is produced in small quantities upon the discharge of electricity through an air gap; and it was found that by increasing the potential and the length of the air gap the heating effect of the current was decreased and within certain limits the amount of ozone increased proportionately.

At about the time of the utilization of the glass plate electrostatic machines, ozone was produced by allowing the circumference of two concentric wheels fringed with tinsel to rotate in opposite directions very close to each other, the rotary movement of the wheels tending to cool the discharge between the tinsels and the continuous momentary contacts of the tinsel points were sufficient to start sparks which would then elongate with the motion of the wheels. Upon the improvement of electro-magnetic transformers and the improvements in insulation, it was found that ozone could be produced without further mechanical complications by employing transformers and having a series of brush discharges from the points of metallic electrodes. It was a gradual and natural growth from this to the interposing of a thin dielectric between the points from which the sparks emanated. This spread the discharge over the surface of the dielectric and allowed a greater area of contact of the discharge with the quantity of air that could be blown through the gap. From this it was a natural step to the forming of machines in which the discharge took place between flat or circular plates that were accurately distanced, one from the other, at all points; and the last stage in the method of manufacture was reached by the employment of a double walled dielectric with an intermediary gas gap across which a silent discharge of high-tension currents flowed in a uniformly intense field. This last method for the production of ozone is especially commercial because the current can be directly drawn from commercial lines of sinusoidal alternating currents operating at 60 cycles; the only intermediary apparatus to be used being a single transformer stepping the initial current from 110 volts to the necessary secondary voltage. The range of potential throughout which these machines are operative depends somewhat upon the design of the machines, the chemical characteristics of the glass dielectrics and intensity of concentration which it is desired to produce. It has been decided, however, that the formation of ozone does not take place in any measurable quantity until the voltage has reached 7,000 and the efficiency of the apparatus is increased to 16,000 or 18,000. It is practically nil at 30,000 to 35,000 volts, depending, of course, upon mechanical design.

The ozone molecule is formed by three atoms of oxygen held in unstable combination which is easily broken down at temperatures ranging from 100 deg. C. to 270 deg. C. If the ozonized air is brought to a temperature of 100 deg. C., the production of ozone is materially decreased and if the temperature is carried beyond 270 deg. C. the ozone is practically all destroyed as soon as it is made. The temperature values of the ozonized gas are, therefore, an important factor in the designing and operating of ozonizers and the problem is confined to one in which the greatest amount of energy can be delivered from a given surface with the least amount of temperature rise. It is evident from this that the old method of the production of ozone by means of streamers or sparks is erroneous, because as the ozone is formed by the production of these sparks it is immediately destroyed because of the temperature, and the total amount of ozone resulting from the machine can be considered more in the nature of a by-product than anything else. It is also this fact that explains the numerous failures in the attempts to manufacture ozone machines utilizing low-tension currents in which the total temperature factor becomes of utmost importance and in which it was necessary by expensive and uneconomical artificial means of refrigeration, to cool the electrodes and the air to be ozonized. It also explains the fact that the concentration of ozone does not run in proportion to the economy of production per k.w.-hour, and at any given temperature the increase in economy is produced by a small concentration and the application of large quantities of air passing through the apparatus. This tends, of course, to reduce the central points of heat that might be developed by stray sparks which would make a hot path for themselves through the gas. As a matter of fact this is shown by the production of the various machines having the same relative area of electrification, a chart of which is shown in Fig. 3.

There is another condition which has to be contended with in operating ozonizers for a maximum economy of production, and that consists in counteracting the effect of humidity upon the production of pure ozone gas (Fig. 4). Although the actual chemical action that takes place when moisture is present in the field in which ozone is formed is not clearly defined, it is

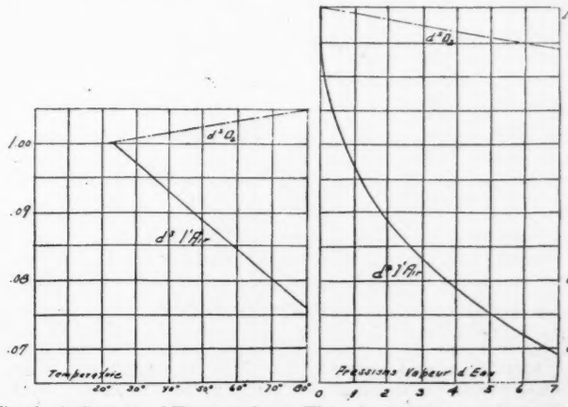


Fig. 3—Influence of Temperature Upon the Production of Ozone

Fig. 4—Influence of Humidity Upon the Production of Ozone

probable that it is due to a partial decomposition of the air by the production of a hyponitric acid, to the combinations of nitrogen, and to combination of hydrogen and oxygen, various combinations of which are first produced and then destroyed by double decomposition, due to electrolytic action of the current and the almost immediate destruction of these combinations by the heat. In actual practice it is found to be perfectly feasible to make ozonized air without the slightest detectable quantity of nitric acid being present. This is only possible, however, when the air has been dried before being brought into the influence of the electrical field, and no ozone apparatus can possibly produce a combination of ozone and air without the presence of nitrogen compounds unless this air has been previously dried.

Various kinds of apparatus for producing ozone have been placed upon the market and some have been designed with an aim to cool the dielectrics during the discharge of the current across the gas gap; some of these utilized artificial refrigeration, some employed water which is also used as an electrode and still others use a cooling oil which acts as a dielectric as well. In practical application this last idea is probably the most satisfactory one, as it prevents accidental grounds and is automatic in its operation of preventing a short-circuit to the transformer should the dielectric tubes break down.

Apparatus designed for the production of high concentrations of ozone must necessarily include three essential factors, viz., first, ease of operation; second, durability; third, be properly protected from breakdowns due to heat by the prevention of undue heat across the discharge gap.

Although it is not essential that ozone be of a high concentration in some applications, it is of the utmost importance in its application to industrial lines and to the purification of water and sewage. It has been established that a concentration of from four to six grammes per cubic metre is sufficient to destroy most pathogenic germs, and even this concentration will destroy all known germs if the time of contact of the gas with the germs is sufficiently prolonged. The factor of intimacy of contact between the germs and the gas, as well as the length of time which these germs are exposed to action of ozone, are the chief problems and in fact the only problems in connection with the sterilization of water for potable purposes.

Fig. 5 shows a perspective view of a characteristic type of ozonizer that is capable of producing concentrations up to 28 grammes per cubic meter and at lower concentrations producing ozone at an economy of 70 to 80 grammes per k.w. per hour and above.

Fig. 6 shows a cross sectional detail of this apparatus, in which *A* is a wrought-iron tank filled with 300 deg. test mineral seal oil up to the point marked *B*. This tank carries a marble slab *C* which has mounted upon it the aluminum casing *D*, which forms the initial air reservoir and the protective means around the high-tension busbar *E*. The top of this aluminum casing is provided with a glass cover *F*, through which the action of the tubes may be seen. These tubes are of the dimensions shown and are mounted in 10 pairs of inner and outer tubes. The inner tubes are sealed in a porcelain cover *G* of the procelain box *H*, the box itself being the support for the outer tubes as shown. The current is led through an insulator in the aluminum casing along the busbar *E* and fed to all the inner tubes in parallel. The other potential is brought through an insulator mounted in the rear of the machine as shown in the perspective and marked No. 17. The current from this second insulator is led through a substantial busbar *I* and distributed to the 10 outer tubes in parallel through the automatic clips attached to the busbar. Bearing in mind that the inner and outer tubes are concentric and that the inner tube is coated on the inside with tinfoil and the outer tube on the outside with tinfoil, it will be seen that the air passing down through the inner tube and coming up through the gas gap between the inner and outer tubes is subjected to the

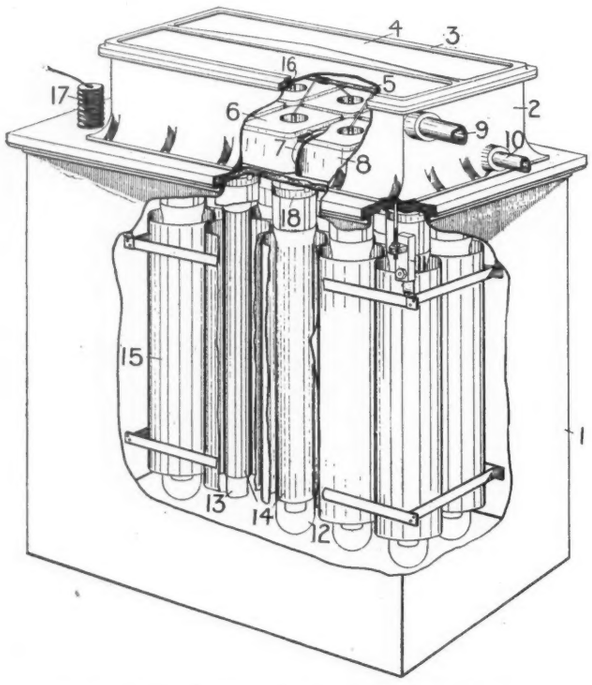


FIG. 5.—PERSPECTIVE VIEW OF TEN-TUBE OZONATOR

Key to Figures 5 and 6

1, sheet steel tank; 2, aluminum casing; 3, casing cover; 4, glass; 5, upper bus bar; 6, inner tube holder; 7, tightening band; 8, outer tube holder; 9, inlet-dry air; 10, outlet-ozone; 11, barrier insulator; 12, outer tube; 13, inner tube; 14, tinfoil; 15, barrier; 16, glass holder 17, insulator; 18, outer tube contact.

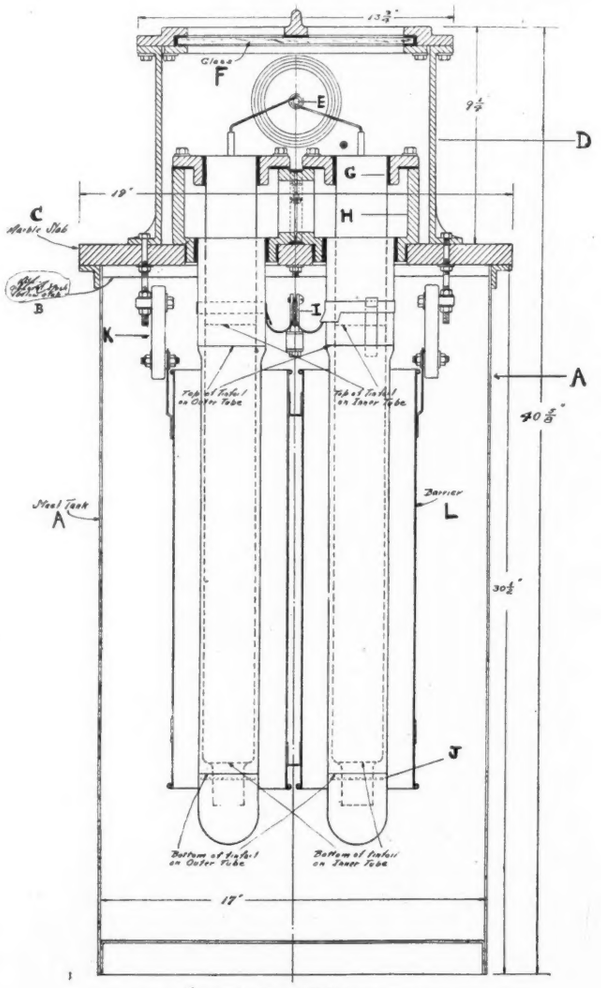


FIG. 6.—CROSS-SECTION OF FIG. 5

electrical discharge in that gas gap, but not in the presence of any metal electrode. On account of the curved form of the outer tube at its upper end and the incurved shape of the inner tube at its lower end there is no surcharge of electric potential along the edges of the electrodes that would cause disrupted sparks to pass across these edges. This insures a uniform density of electric discharge throughout the entire area between the electrodes and is a preventive of the production of undue heat at any particular point. There is, of course, some heat developed by the action of the current and the dielectric absorbing this heat tends to become distorted. This is taken care of in this apparatus by the fact that one end of each of these tubes is free to expand and that the concentric position of the inner tube is assured by the use of fiber stars *J* placed at the bottom of the inner tube. Because of the high-tension current that is used, it was found that a great deal of induction took place between the tubes themselves and the outside casing *A*. In order to overcome this inductive loss and regulate the superimposed wave forms, an inner condenser or "barrier" *L* was placed in the oil bath and surrounding each pair of tubes, all of these individual condensers being connected electrically but insulated from the outside casing by the supporting porcelain insulators *K* at the top and by the use of the insulating oil around all sides. As these condensers are tubes, it will be seen that they have an added advantage of forming a sort of chimney which aids in the circulation of the cooling medium, viz., the oil.

The general construction is most substantial and evidently not liable to wear or depreciation. The parts are rigidly put together and every means taken to insure continuity and safety of operation.

Each one of these machines at a current consumption of 300 watts, including transformer losses, is capable of taking care of from 65,000 to 80,000 gallons of water in 24 hours. They are made in standard sizes in order to permit of economical manufacture; and in the case of large installations for taking care of several million gallons, these units are simply multiplied.

There are several of these machines in practical industrial use in the bleaching of various fats and oils, in connection with the cyanide process for the extraction of gold and in sterilization of air and water and the deodorization and purification of sewage and rancid oils.

Perhaps the most valuable use of ozone to the world at large is its application to water that is to be used for drinking purposes. The fact that the alkaline constituents of the water are not changed by the action of the ozone and that bacteria are destroyed renders this gas of inestimable value to the public. This, taken in connection with the fact that its application to water is automatic and that, at an almost negligible increase of cost, a safety factor of four or five can be applied and that the ozone itself is not retained by the water, renders this method of purification much more acceptable than the use of any other known system.

Without going into great detail in regard to the chemical and bacteriological effects, it is perhaps sufficient to state that the destruction of bacteria is dependent upon the destruction of the cell containing the germ. Fortunately for humanity, the majority of pathogenic germs are readily attacked and destroyed by this gas. The efficiency of the germicidal action is dependent, as before stated, both upon the concentration and the time of contact of the bacteria with the gas. This has led to several different systems for the purification of water, all having as the objective point the intimate mechanical contact of the gas with every particle of water to be purified. To this end scrubber towers have been utilized which are exactly similar to the towers used in the manufacture of sulphuric acid. In these the water trickles down over pebbles or specially formed obstructions which are intended to break the water into thin films, in which condition the ozone can act upon the bacteria and organic matter. Still another form of tower is one in which the ozone is brought into the bottom of the tower and water into the top. The water in falling the length of the tower is broken up into sprays by obstructions in the form of flat plates having perforations or by means of inclined trays which are perforated, the ozone traveling upward through the perforations. A third method is to utilize a form of injector whereby the movement of the water through the pipe draws in the ozonized air, mixing it thoroughly with the water as it passes through the pipe. The beneficial action of this system is sometimes augmented by the use of a tower in which the mingled water and ozone are brought in together through the bottom and allowed to pass up through the tower through obstructing plates of non-oxidizable material which further breaks up the water and bubbles of gas, as in the Twombly tower. The water is then allowed to overflow from the top into a receiving basin, where it is agitated by falling over riffles which effectively remove all trace of any remaining ozone. It is to be borne in mind that ozone is not absorbed by the water to any great extent, but is merely held in mechanical suspension and is easily liberated by agitation.

A method of bringing the water in contact with ozone is shown in Fig. 7. In this method a tower, shown in the drawing, 8 feet x 7 feet x 8 feet, made out of reinforced concrete, is provided with a multiplicity of small spray-forming jets, made somewhat along the lines of a fish-tail gas burner. Water is forced through the inlet by means of an injector which draws in the ozonized air, and is sprayed under pressure through these various nozzles. The tower itself is filled to required concentration of ozone by means of the inlet *B* coming directly from the ozonizers. In the stem of each spray head is the small injector *C* which draws its ozonized gas from the sterilizing chamber. The method of operation of a plant of this sort is to fill the sterilizing chamber with a predetermined concentration of ozone and then allow the water to spray into this atmosphere, drawing it from the outlet *D* to the clear-water reservoir. This form of sterilizing tower is in all probability more efficient than any of the others, as it is the only one in which an excess of ozone is presented to a comparatively small quantity of water. The plant as shown in this figure is capable of taking care of 260,000 gallons of Croton water in 24 hours, and consumes 300 watts of electricity per ozonizer. It is automatic in its action and has no moving machinery in connection with it, the ozonizers being started by closing the switches on the switchboard. The total energy of operation is indicated by the wattmeter on the board. The airmeter is introduced in the piping for the fresh dried air before it reaches the ozonizers for the purpose of making determinations on the concentration.

The ozone apparatus referred to in the last description utilized what is known as the Gerard process, a French invention. Tests upon this have been conducted by the director of the Connecticut State Board of Health, Prof. H. W. Conn, and also by the Lederle laboratories of New York City. Prof. Conn stated that the ozonator, although no one in the laboratory had had previous experience with such machines, ran without any hitch and without attention. At the time of writing, a few weeks ago, the efficiency of the machine in producing ozone had not been determined at his laboratory, but a number of experiments had been conducted on its efficiency in purifying water.

In the first series of tests water heavily inoculated with B. coli was sprayed into the tower, remaining in contact with the ozone only about three or four seconds, and was then drawn off and analyzed bacteriologically. From 100,000 to 300,000 bacteria per c.c. were placed in the water to be purified. Varying concentrations of ozone, ranging from 8 m.g. per liter down to 2.5 m.g., were experimented with. While the efficiency was less at the lower concentration, even this "destroyed the B. coli so efficiently that none could be found when 1 c.c. was inoculated to litmus in lactose plates and incubated at 37 degrees centigrade. When, however, 5 c.c. of such treated water was inoculated in the fermentation tubes a production of gas was found, due, as subsequent tests proved, to B. coli, indicating that there were at least as many as one of these

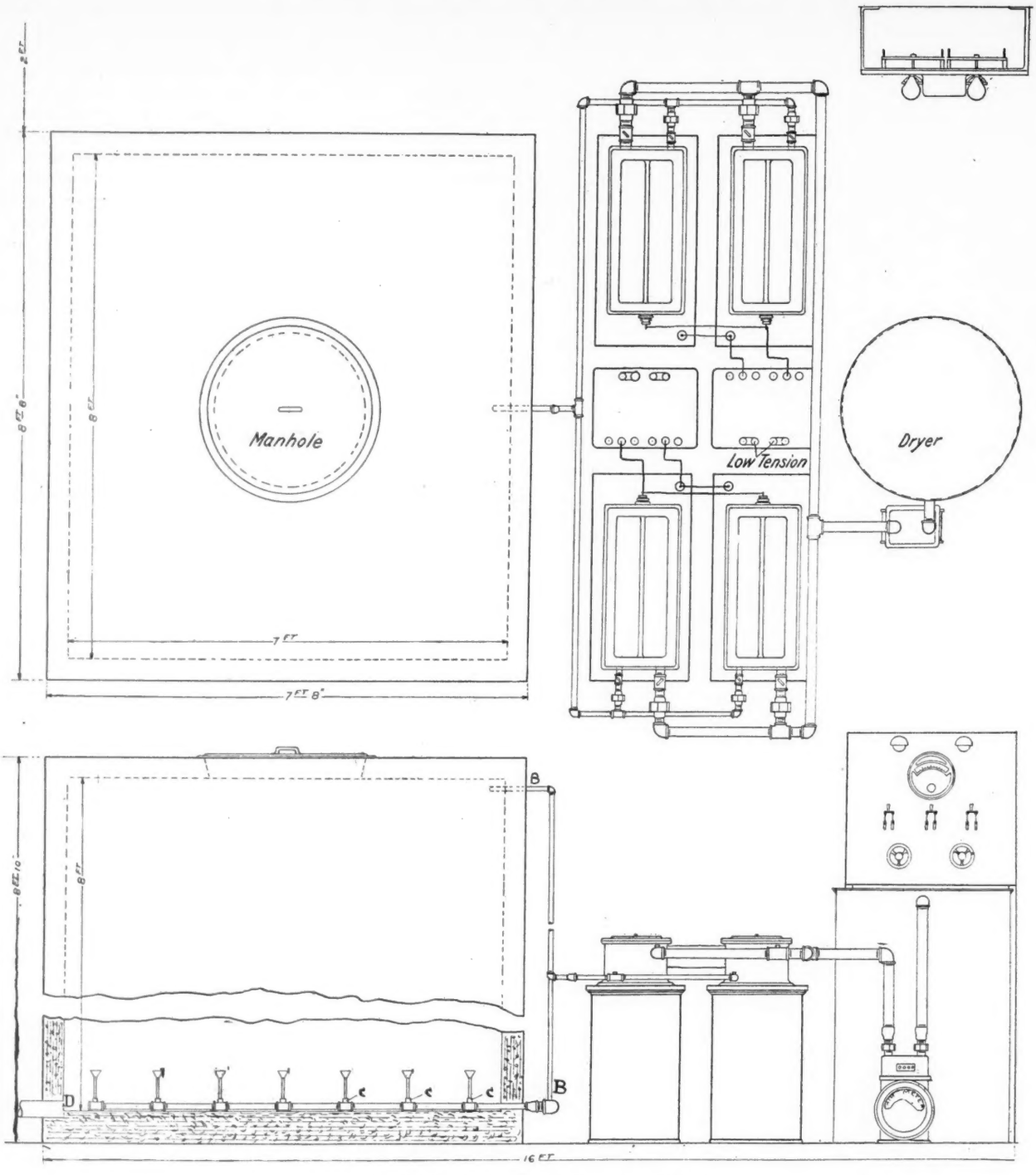


FIG. 7—FOUR-UNIT STERILIZATION PLANT

bacteria left in each 5 c.c. of water. The destruction of B. coli when inoculated thus in water in pure culture was over 99.99 per cent."

Another series of tests was conducted upon Connecticut river water, which receives the sewage of Hartford sixteen miles above and contained from 1,000 to 3,000 bacteria per c.c., B. coli always being found in considerable quantities. This water was purified as completely as that artificially inoculated. "At a concentration of 6 no B. coli could be found in the treated water. At a concentration of 2.5 no B. coli could be found upon plating 1 c.c. in litmus lactose agar, but 5 c.c. inoculated in fermentation tubes showed the presence of an occasional B. coli left alive." The action of the ozone on other bacteria varied with the number of spore-bearing bacteria present. At concentration of 2.5 about 150 bacteria (10 per cent) were left alive; and at a concentration of 6.4 about 40 were left alive, all spore bearers in each case. As disease organisms are not spore bearers, the fact that such bacteria were not killed does not argue against the efficiency of ozone in rendering the contaminated water potable.

"This efficiency in purification of water is about the same as that of chloride of lime, judging from the reports upon the latter, which I have not tested personally, and in my opinion ozone may be made thoroughly efficient in rendering potable the waters of streams. This is certainly true so far as concerns the destruction of the pathogenic bacteria liable to be found in contaminated water."

In addition to the report which is abstracted above, Prof. Conn submitted itemized descriptions of the experiments made, one of which is given as an illustration.

December 16, 1909.

EXPERIMENT No. 8

Thirty gallons of tap water inoculated with a culture of B. coli and then sprayed into the tower. Samples were taken, both of the raw and the sprayed mixture, and concentration tests were made of the air in the tower at the same time.

Sample	Concentration.	Bacteria per c. c. Agar 48 hrs. 20° C.	Agar 48 hrs. 37° C.	Gelatine 48 hrs. 20° C.
No. 1. Raw water before adding B. coli.....	7.5	5,500	5,400	1,200
No. 2. Raw water after adding B. coli.....	.....	170,000	150,000	195,000
No. 3. At the beginning of the spraying.....	.....	20	41	4
No. 4. At the middle of the spraying	.....	8	65	2
No. 5. At the end of the spraying	6.1	10	60	10

Capacity of tower, 980 litres.
Rate of spray, two gallons per minute.
Ozonizer stopped at 2.50 p. m.
Spraying was begun at 3.21 p. m.

The raw water was run continuously through the tower and concentration tests were made every fifteen minutes. No ozone was run into the tower, and as far as possible the tower was made free from leaks. It was noticed that as the water ran from the bottom of the tower it drew with it some air, which, naurally, would tend to lessen the amount of ozone in the tower.

The report of the Lederle Laboratories on tests made of the Gerard ozone process for disinfecting air and water, made August 18, 1908, was as follows:

CONDUCT OF EXPERIMENTS

The atmosphere of the rooms containing the ozone apparatus is drawn into the apparatus by electric fans. After being ozonized it is discharged through pipes into receptacles or can be released into the rooms.

In the first tests threads impregnated with a suspension of living colon bacilli were placed in a closed glass box and the ozonized air introduced for a period of fifteen minutes. The object of this experiment was to test the power of such ozonized air upon bacteria contained in a confined space.

Water known to be highly contaminated with bacteria was divided into three portions in sterile bottles. The first portion was kept as a control. The second was exposed for 1½ minutes to the flowing ozonized air bubbling up through it which flowed from a glass tube immersed in it. The third was exposed to the action of flowing ozonized air for 2½ minutes. This experiment had as its purpose the testing of the power of ozonized air to sterilize water.

Eleven cards to which were attached threads impregnated with a suspension of living colon bacilli were placed at various intervals around the room containing the apparatus. The windows and doors were closed but no attempts were made to close up cracks, etc. The ozonized air from the apparatus was then allowed to flow directly into the room. At the end of one hour two of the cards were withdrawn. By this time the atmosphere had become intolerable and the operators were compelled to leave the room and wait in an adjoining room. At the end of two hours the room was entered and two more cards withdrawn. At three hours two more cards were obtained and at three hours and fifteen minutes the remaining five cards were withdrawn.

These and all other specimens were then taken to the laboratories for examination. The waters were inoculated as usual in fermentation tubes and plates and the threads were all placed in fermentation tubes.

RESULTS

Experiment 1. The colon threads exposed in glass box fifteen minutes placed in lactose bile fermentation tubes incubated at 37 degrees C. for three days.
Positive 6 (colon present).
Negative 4 (colon destroyed).

Experiment 2. Sterilization of water.

		Control Water	Water exposed 1½ min.	Water exposed 2½ min.
Lactose Bile— (10 tubes 1 c.c. each)	Positive	0	0	0
	Negative	10	10	10
Lactose Litmus Agar	Acid colonies.....	1	0	0
	Other colonies....	29	3	1
Bacteria per c.c.	At 20° C. 48 hrs..	720	3	4
	At 37° C. 24 hrs..	2574	3	2

Experiment 3. Eleven colon threads placed in room placed in lactose bile fermentation tubes incubated at 37° C. for three days.

	Positive	Negative
3 Control threads.....	3	0
2 Exposed one hour.....	0	2
2 Exposed two hours.....	1	1
2 Exposed three hours.....	0	2
5 Exposed 3 hrs. 15 min.....	0	5

CONCLUSION

From the foregoing experiments it appears that:

1. Fifteen minutes exposure in a closed box is not sufficient length of time to insure the sterilization of colon threads. Out of ten threads exposed in this way six remained unsterilized.

2. The sterilization of water is practically accomplished in 1½ minutes under the conditions noted above.

3. Three hours exposure of a room to ozonized air under the conditions noted above seems sufficient to kill such bacteria as the colon.

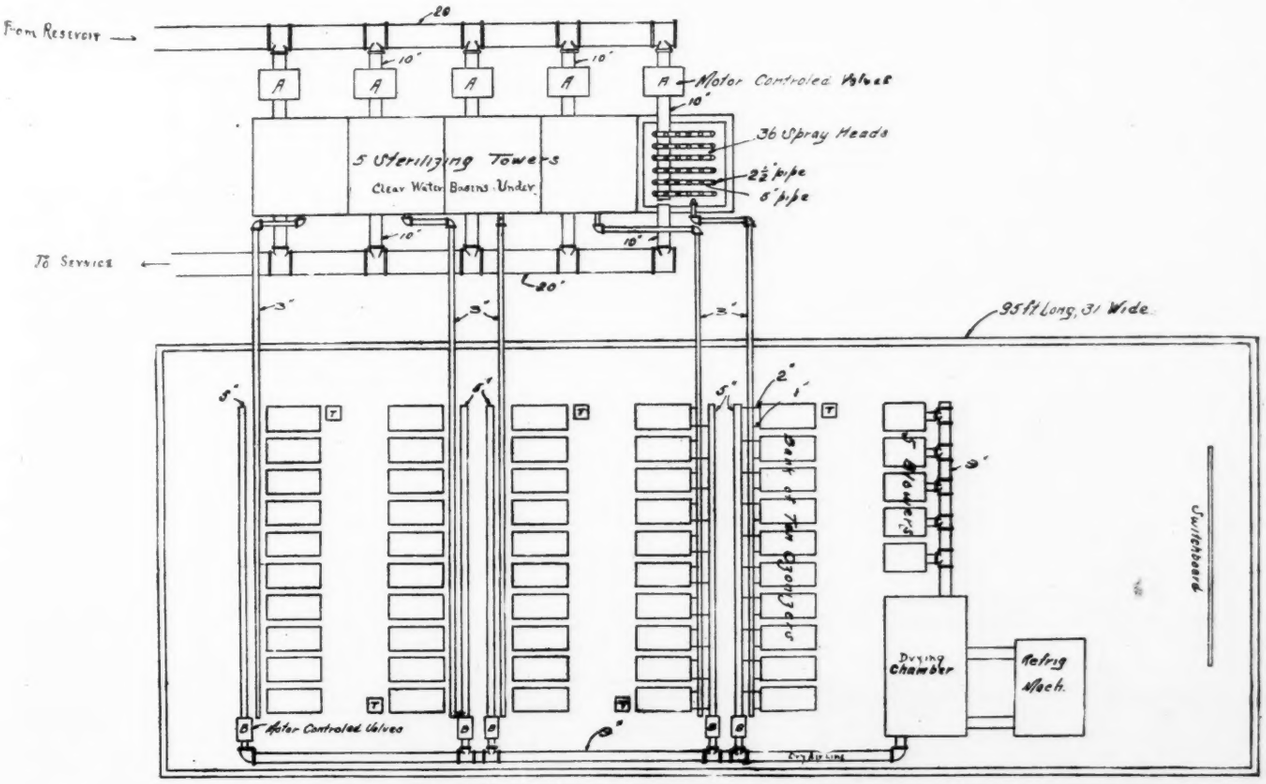


FIG. 8—LAYOUT FOR STERILIZING 3,000,000 GALLONS IN 24 HOURS. ONE BANK HELD IN RESERVE

In the purification of sewage the same problem of an intimate contact between the organic matter and bacteria and the ozone is met. This is, however, further complicated by the difficulty of separating the solid matter from what is known as the effluent. This is to a certain degree made possible by the use of sedimentation tanks and more perfectly by mechanical means, as in the Leet process. If the solid matter is sufficiently separated from the liquid, the liquid itself may be sterilized to such a degree as to render it harmless upon turning it into a stream; and the solid matter itself may be taken care of by changing it into commercial fertilizer by the introduction of the necessary ingredients.

While mechanical separation has the disadvantage of requiring the use of power, it usually presents a decided advantage on account of the small amount of space occupied and the comparatively small amount of capital necessary to install. Also, because of its being enclosed in a small building, its compactness and the deodorization by the ozone, it presents no nuisance and can be placed at the most convenient situation.

The problem of sterilizing sewage by means of ozone has never been satisfactorily worked out in large installations, although it is apparent that the usefulness of this method of taking care of sewage is of the utmost importance.

It would perhaps be worth while to note here the report of Dr. Roux, director of the Pasteur Institute of Paris. Dr. Roux was employed by the city of Paris to investigate different methods of sterilization of water to be supplied to the inhabitants of that city. Several schemes had been offered and the following quotation is in reference to an installation which would cost considerably over a million dollars. Dr. Roux in his report says:

We have found that sand filters do not retain all the bacteria that are contained in water. They considerably reduce the number when they are conscientiously built and are operated under suitable conditions, but not without attentive and constant watching. In order that these conditions may be favorable, it is necessary to have a constant pressure of water and that the superficial layer of coagulant is not disturbed and not forced through the sand. At their best they are a bulky apparatus which require constant attention and frequent cleaning, and may by oversight be a source of germ incubation rather than a preventive. * * * * * *

We recommend that in order to have a higher degree of security and to introduce into the city mains nothing but irreproachable water, that the administration use filters to clarify the Marne water and to complete the purification of the clarified water by ozone.

The laboratory experiments performed by Frolich and Ohlmuller have demonstrated that it is only necessary to bubble ozone through water to destroy all of the bacteria that are contained in it. This elimination is most rapid and the ozone dissolved in the water quickly disappears upon agitation. The water is found after this treatment to be exactly in the same state as

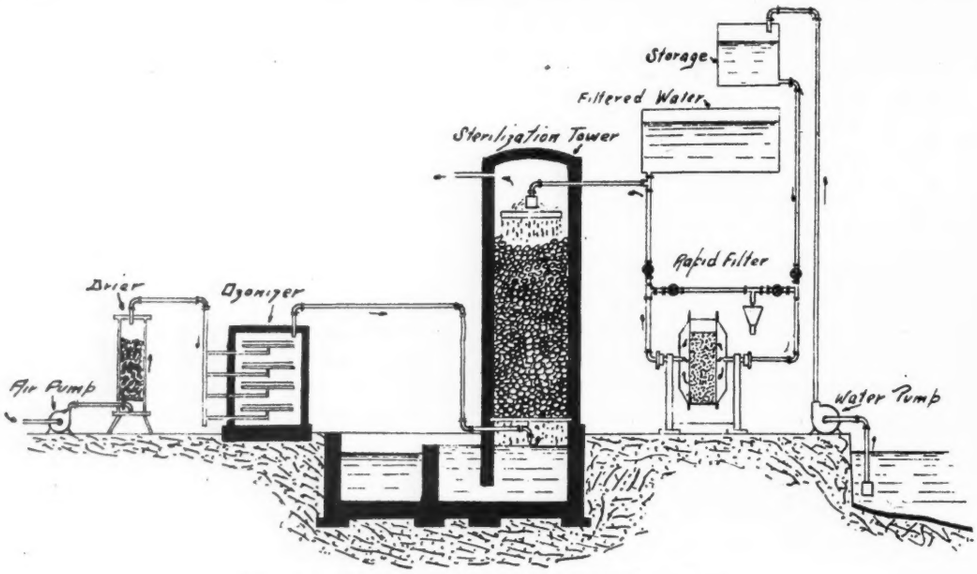


FIG. 10.—SIEMENS LAYOUT FOR STERILIZING WATER

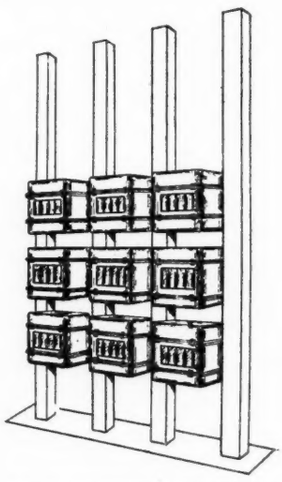


FIG. 9.—BATTERY OF SIEMENS OZONIZERS

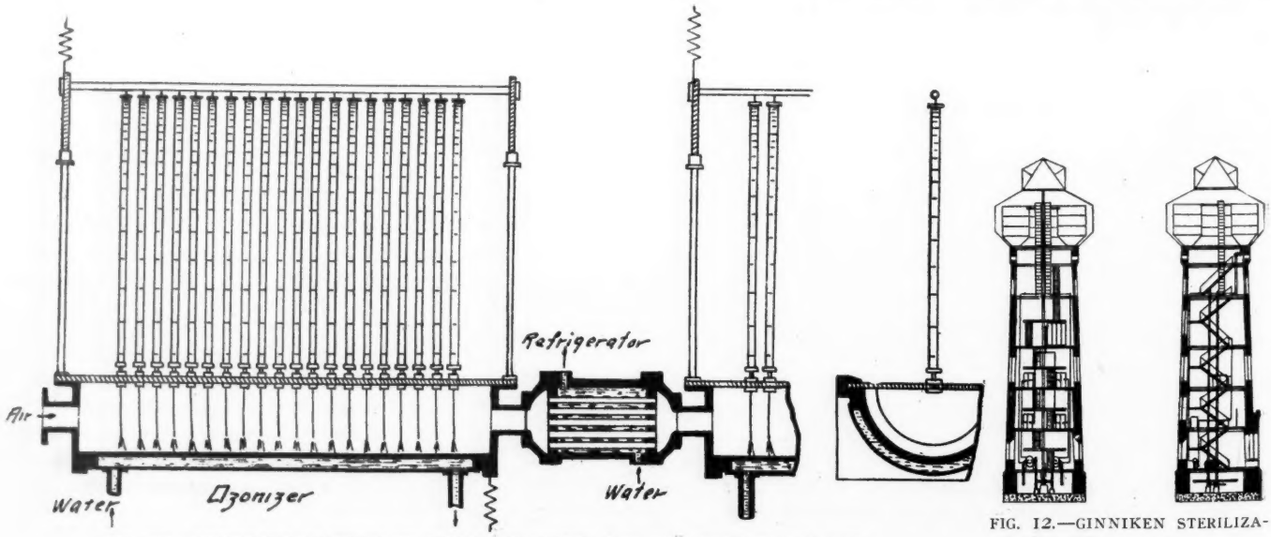


FIG. 11.—SCHEMATIC DRAWING OF TINDAL-SCHNELLER AND VANDERSLEEN OZONIZER

FIG. 12.—GINNIKEN STERILIZATION PLANT

it was before with the exception of the destruction of the bacteria. It was found that in a water containing organic matters, the ozone oxidizes the organic matters first and destroys the microbes afterwards.

Your reporter was a member of the Commission appointed to verify the results obtained at Lille, at Colne and at Chartres. He was very much astonished by the degree of purity that could be reached by the use of ozone. The destruction of bacteria can be made complete, even the one of sporulated bacteria, such as the B. subtilis, which is among the most resisting to other agents. In many tests it was possible to pollute several centicubes of ozonized water without obtaining any cultures. These results are only obtained on the condition that the water does not contain any quantity of matter in suspension sufficiently large to offer shelter to the bacteria against the contact with ozone and that the contact of the water with the ozonized air be intimate and of a sufficiently long period.

As a conclusion to all of the tests our Committee has made, it is possible to say that we now have at our disposal apparatus which will totally sterilize water and this at the lowest possible cost.

The opinion expressed by Dr. Roux is also confirmed by bacteriologists and other scientists all over the world, including Van Ermengem, Ohlmuller, Proskauer, Schuder, Erlwein, Calmette, Soper, Turneaure, Phelps and Conn.

The operating cost of the sterilization of water by means of ozone is dependent upon three factors:

First.—The amount of filtration necessary to remove suspended matter.

Second.—The amount of organic matter and bacteria still retained after filtration.

Third.—The cost of electric current per kilowatt-hour.

Several estimates of cost of operation are given below.

The total cost of an installation for 2,500,000 gallons in 24 hours is given as an example. In this particular installation the water was taken from a river highly polluted with sewage and containing a large amount of rough suspended matter. The items making up the cost of the plant are as follows:

Filters	$15,000
Sterilizing towers with all necessary piping	3,000
Riffles and clear water basins	2,000
Ozonizers and auxiliary apparatus, including in this figure a refrigerating plant for removing moisture and automatic electrically controlled valves on the water system	15,000
Housing for apparatus	9,000
Making a total of	$44,000

The operating cost of this plant, exclusive of interest, maintenance and labor, is $3,000, which includes oil, minor repairs, etc., labor for adjustment of valves and testing. The labor consists of a day engineer and an additional man, who operates the filters already at the plant. The owners of this plant place the interest on the investment at 6 per cent and all maintenance and depreciation at 10 per cent, the depreciation being almost entirely in the refrigerating apparatus as none of the ozonizers have to be repaired.

Along this line it is interesting to note that a filtration plant and ozonizing plant, including all excavations, foundations, housings, filters, sterilizing tower, ozone apparatus and a clear-water basin, sufficient to take care of 15,000,000 gallons in 24 hours, was estimated at $188,725, for the city of Niagara Falls, N. Y., and that the cost of operation, including interest and sinking fund and operatives, was placed at $3.06 per million gallons. At this plant, however, electric current was exceptionally cheap. This cost of operation could probably be lessened considerably had spray towers been estimated upon, as the forms of sterilizing towers other than this permit of an enormous waste of excess ozone from the tower, whereas, in the spray tower system it is only necessary to furnish an amount of ozone that will take the place of gas that has been used up in the destruction of bacteria and organic matter and in the bleaching out of the water. After a plant of this sort is once in operation, the amount of ozone necessary to produce a sterile water is about one and three-quarter parts in a million.

Tests made on an ozonizer plant recently gave the following results: Average temperature of air entering, 67°; of that leaving, 65°. Liters of air per hour, average, 3,575; minimum, 1,200; maximum, 10,000. Voltage, primary, average 100; secondary, average, 14,750. Amperes, average, 5.64, but about 6 in most of the eight tests. Total watts, average, 402. Concentration, average, 9.2. Production, 67 grams per kw-h.

THE SEWAGE SLUDGE PROBLEM

IN discussing the description of the Columbus sewage disposal plant which was presented by Mr. John H. Gregory before the American Society of Civil Engineers, Mr. C. E. A. Winslow, Biologist in Charge of the sanitary research laboratory, and sewage experiment station of the Massachusetts Institute of Technology, presented quite forcibly the problem of the disposal of sludge which, in spite of modern advance in sewage disposal, still remains a serious one. His remarks in this connection were as follows:

There is no doubt, on the whole, that the trickling filter furnishes a cheap and satisfactory method of securing organic stability. It is an ideal oxidizing machine. The problem of suspended solids, however, it does not solve; and this remains the most serious problem in sewage disposal. The analytical data for the operation of the Columbus plant for 1909, given by Mr. C. B. Hoover, are the basis for the figures in the table, which indicate the extent of this problem in a striking manner. The figures for the mean daily flow through the sedimentation tanks have been calculated from the data relating to the percentages of the time these tanks were in service, assuming that the periods were representative ones. It appears from Table 20 that 2,115 tons of dry solid material are annually removed from the Columbus sewage, amounting to about one-half ton per 1,000,000 gallons. A part of the 1,777 tons deposited in the septic tanks will of course be liquified, but probably not more than half. Mr. Hoover's figures indicate that four of the tanks were cleaned twice during the year, and the other two four times. At present Columbus is fortunate in being able to discharge its sludge into the Scioto River at periods of high water. For cities not so well situated this question of sludge disposal remains a very real one.

Suspended Solids at Columbus, 1909.

	Mean daily flow, in millions of gallons	Suspended Matter Removed (Influent Minus Effluent) Parts per million	Pounds per day	Tons per year
Septic tank	11.1	118	10,892	1,777
Sedimentation tanks	5.8	43	2,072	338

There are two main lines along which the solution of this problem may perhaps be sought profitably. The first is the perfection of the septic tank, or some other form of biolytic chamber, so that a larger proportion of the sedimented solids may be eliminated by microbic digestion. The writer has become convinced that the principal factor which prevents more complete solution of suspended solids is the over-septic condition of the sludge due to the accumulation of waste products of bacterial life. If this be the case, tanks built like the Hampton and Ems tanks, in such a fashion as to separate the sludge from the flowing sewage, keeping the sewage fresh and the sludge as stagnant as possible, are designed on a diametrically wrong principle, as far as the sludge solution is concerned. At the new experiment station of the Massachusetts Institute of Technology, the reverse principle has been applied. A septic tank has been constructed on the Dortmund pattern, the influent entering near the bottom and being skimmed off at the top, so that the sludge is constantly washed and kept from an over-septic condition by the incoming sewage. No data as to sludge digestion are as yet available, for the tank, thus far, has been operated (8 months), without the necessity for cleaning; but the effluent is of excellent character.

The other possible avenue of approach to the sludge problem lies along the line of utilization. The history of sewage purification is one long story of disappointment as to the extraction of any useful by-products; yet the failures of the past cannot limit the possibilities of the future. Reports of the results already achieved in England and Germany by the reawakening of efforts along this line are not very convincing. It is possible, however, that some mechanical improvement may at any time bring the utilization of concentrated sludge—particularly where manufactural wastes are present—within the range of practical consideration.

LOW-GRADE FUELS

THE use of low-priced fuels is advocated in an article in the *Isolated Plant* for March, as follows:

The Engineers of the United States Geological Survey state that a series of several thousand tests show that

The cheapest fuel in any locality is usually the best to burn provided the draft and other conditions are suitable.

Operating engineers and even owners usually oppose this practice on the theory that "the best (meaning the most expensive) pays." On this theory a gold horseshoe would be better than an iron one.

The price of fuel does not indicate its heat value, but only the breadth of its distribution and the cost of producing and delivering it.

Low-priced fuel requires skilled firing and suitable appliances. These requirements, while inexpensive, prevent the development of as great a demand for it as for the higher priced fuels, such as No. 1 Buck, Pea and Egg coals. Notwithstanding the higher price of the latter, there is very little difference in the heat values.

As stated in the last paragraph of this quotation, skilled firing and suitable appliances are required to properly handle low grade fuels; and it is probable that in most small plants it would cost more to provide these than could be saved in the purchase of the fuel. It seems worth while, however, to consider the expediency and economy of using the cheaper fuels, but it would be advisable to have analysis of heat values of proposed fuels made, and in comparing these to consider the cost of handling the additional ash as well as that of the greater skill and more expensive appliances needed in applying the fuel.

However, the article referred to gives illustrations of comparatively small plants where low-priced fuel has been used with economy. A hospital in New York City, which had been using pea coal costing $4.10 a ton, burned $697.00 worth in January, 1909, while in February a cheaper coal was used and the bill reduced to $264.00; although it is admitted that a part of this saving was due to increased economy in other directions. A New York hotel had a coal bill of $8,372.69 in 1907 with high-priced fuel, and in 1908 with low-priced fuel the bill was $6,172. A New York manufacturing building whose fuel expense is now less than $2,500 per year would have to pay $3,100 a year if using No. 1 Buck or other high-priced fuel. The article concludes with the statement, "If a fuel has the heat units in it, suitable means can be found to burn it without increased cost of labor or repairs; with some few exceptions the cheaper fuel is the best to burn—provided proper methods are used."

THE RICHMOND CONCRETE CONDUIT

New Reinforced Conduit to Replace One Which Failed—Removing Old Conduit by Blasting—Details of Reconstruction

By J. A. JOHNSTON, Consulting Engineer, Richmond, Va.

A REINFORCED concrete conduit has very recently been completed in connection with the water supply of Richmond, Va., which is worthy of consideration inasmuch as it replaces a conduit of the same class of construction which failed in September, 1908.

The water supply of Richmond is taken from the James River about five miles above the city. It is diverted from the river by a dam into two parallel settling basins about a mile long. At the lower end of these settling basins the water is passed through a coagulating plant into two concrete coagulating basins of a capacity of 24,000,000 gals. each. The two coagulating basins are connected at their lower end to the branches of a 60-inch "Y", the stem of which connects to the conduit in question. This conduit conveys the water to the pump-houses, a distance of 5117 feet down stream.

The conduit runs under an earth embankment for 200 feet, and then out into the river. From there to where it enters the canal feeder, it is laid on the bed of the river at the toe of the C. & O. Railway embankment. This location was made necessary because of the excessive cost and danger in excavating in the canal bank.

The difference in level between the full coagulating basins and the suction of the pumps is 25 feet, which gives a static pressure of 10.8 pounds per square inch.

During 1907 and 1908 a conduit of the section shown in Fig. 1 was built to convey the water supply under this pressure of 10.8 pounds. The base of the conduit was extended to solid rock throughout all that portion which lay in the river bed.

When the water was turned on for test purposes, the conduit burst or cracked throughout its entire length. The Council of the City of Richmond on investigation found that there was faulty work done in the construction. There was considerable contention as to who was to blame, and as yet the matter of adjustment of payment has not been settled by the courts.

In January, 1909, the city received bids from contractors on the reconstruction of the conduit, each bidder to submit his own designs. Fifteen bidders put in 45 different designs of wood, stone, steel, cast iron, brick and reinforced concrete.

After receiving this variety of proposals, the committee

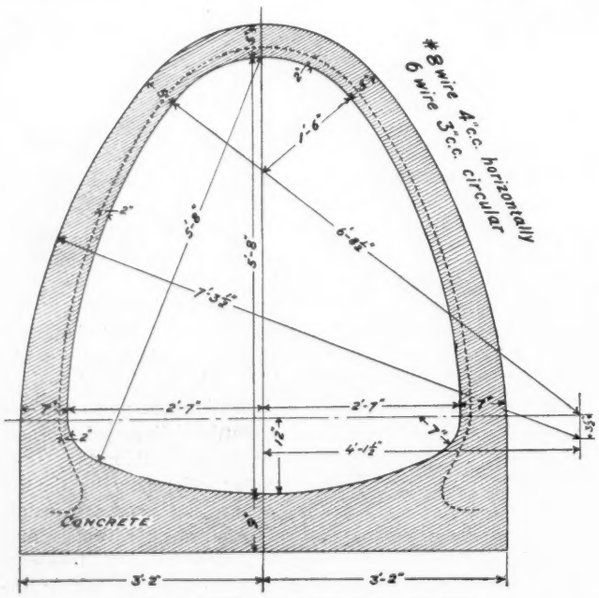


FIG. 1.—SECTION OF ORIGINAL CONDUIT

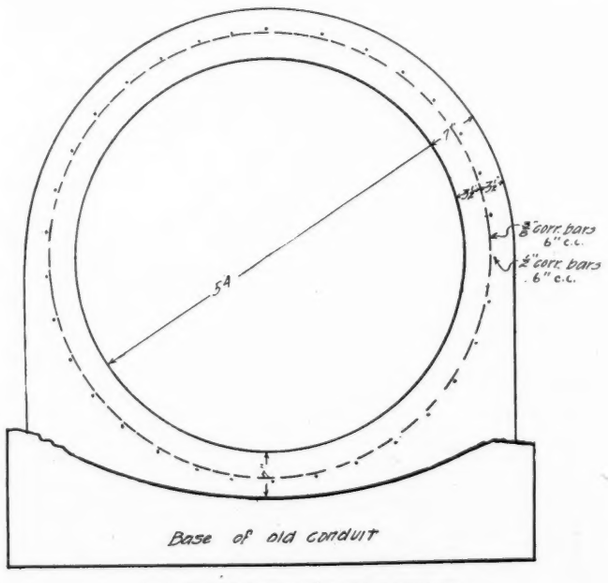


FIG. 2.—SECTION OF NEW CONDUIT

selected the city engineer, the superintendent of water works, the building inspector and the writer as a board to select the suitable proposal.

The one selected was a design which made use of the base of the old conduit and constructed as entirely new conduit of circular section, 54 inches internal diameter, 7 inches thick on the top of this base.

The method of design of the reinforcement was as follows:

No stress allowed in concrete. In a length of 1 foot of conduit, the bursting pressure to be resisted by one side of the ring =

$$12'' \times 27'' \times 10.8 \text{ pounds} = 3499.2 \text{ pounds},$$

allowing 16,000 pounds per square inches in the steel $\frac{3499.2}{16{,}000} =$ .22 square inch. One ⅜-inch corrugated round has section of .11 square inch, therefore the circular reinforcement used was ⅜-inch corrugated bars spaced 6-inch centers.

The longitudinal reinforcement was figured to take the full strength of the concrete in expansion at the elastic limit of the steel. This resulted in about 4 per cent reinforcement, or ½-inch corrugated bars spaced 6-inch centers running longitudinally. The section of this conduit is shown in Fig. 2.

The lower end of this conduit is connected directly into a 60-inch Tee, which connects to two mainfolds, one feeding four water-driven triplex pumps and the other four electrically-driven centrifugal pumps. Because of this direct connection to the plunger pumps, there was provided at the lower end, within 10 feet of the tee, a standpipe of the full size of the conduit, rising 25 feet to the water level of the full coagulating basins. At intervals of 1250 feet along the conduit manholes were provided by making vent stacks 24-inch x 24-inch interior dimensions rising to the same level. There was a drain valve placed just above the bridge where the conduit leaves the river. The James River is given to heavy freshets, especially about the spring and fall equinoxes, therefore the construction was started with a view to coffer damming the whole line next to the river.

During construction several unique points came up, the most difficult being the removal of the old conduit. After considerable experimenting the method adopted by the contractors was to drill 1½-inch holes about 6 feet apart in the top of the conduit, and swing through each hole to about the center of the conduit a dynamite stick with cap. From heavy batteries two wires were run along the top of conduit to which each cap was connected in multiple. About 400 feet of the conduit was thus prepared at a time. Bulkheads were placed in each end of these lengths, and the portion between was filled with water, thereby having the dynamite in the center of the water. Upon explosion the entire crown was blown off and the base left intact, ready for reception of new work. Fig. 3 shows a length 450 feet long full of water ready to have dynamite dropped in; Fig. 4 the explosion, and Fig. 5, 30 seconds after. Fig. 6 shows a closer view of the remarkably regular way in which the old conduit was destroyed.

The forms used were wood, constructed on the job and covered with sheet iron. The longitudinal re-inforcement came in 33-foot lengths and the circular re-inforcement in 64-foot lengths already bent to a spiral of the proper diameter. It was assembled as shown in Fig. 7 and moved as a whole into place.

The outer forms were built as follows:

Inverted U's formed of 6-inch channel steel were set outside of the reinforcement to the proper distance as shown in Fig. 8, which gave the correct shape of the exterior, then inside of these U's, and as the concrete was poured, 4-inch ship-lapboards were placed, each secured to the channels by a nail which was already driven and had simply to be bent over the flange of the channel. Between these channels were placed wooden run-way supports, which also acted as braces for the outer forms.

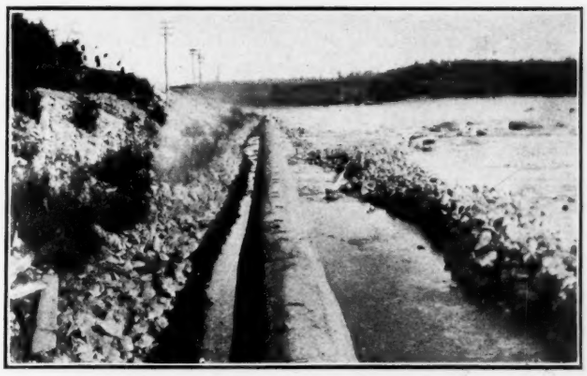


FIG. 3.—OLD CONDUIT READY FOR DYNAMITING

FIG. 4.—BLOWING UP OLD CONDUIT

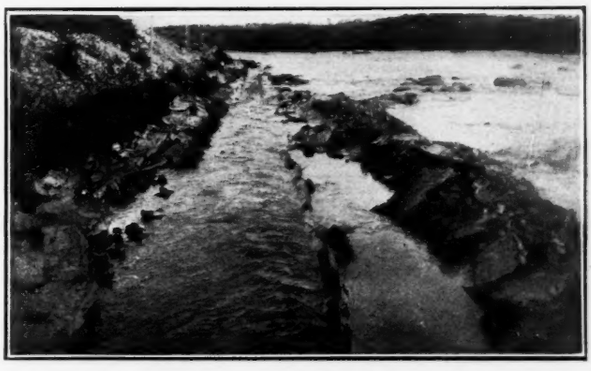


FIG. 5.—THIRTY SECONDS AFTER EXPLOSION

FIG. 6.—SHOWING APPEARANCE OF CONDUIT AFTER BEING BLOWN UP

The joints between successive days' work were made with a view to obtaining water tightness and reinforcing the joint enough to prevent contraction at that point. This was done by stopping each day's work on a vertical joint, and inserting

into the center of the annular section a 16-foot x 6-inch strip of 1/16-inch galvanized iron, which extended an entire circumference. This strip was allowed to project 3 inches out of one day's work, and 3 inches into the next day's work.

Upon completion of the work and putting it into use, there developed in many places between the joints, not at them, cracks extending across the top and about half way down the sides. These cracks leaked slightly in weather below 20° F., but close up entirely in warmer weather.

The contractors were the Piedmont Construction Co., of Atlanta, Ga., of which Mr. R. B. Tufts is engineer and manager.

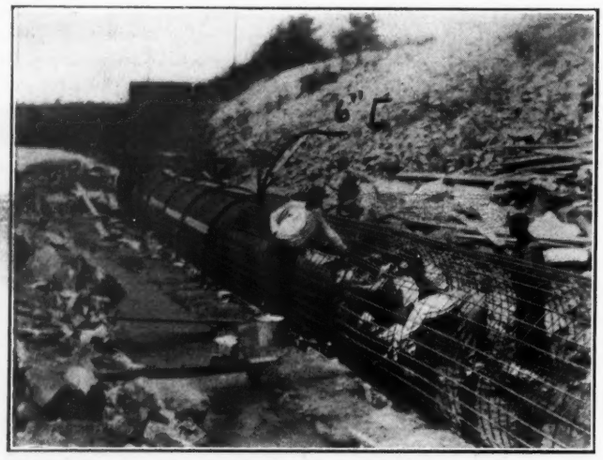


FIG. 8.—U FORMS FOR HOLDING OUTSIDE LAGGING

FIG. 9.—SHOWING WOODEN RUNWAY SUPPORTS

NEW WATER SUPPLY FOR GRAND RAPIDS

ON April 4 a large majority of the voters of Grand Rapids, Mich., ratified a bond issue of $395,000 for installing a water purification plant. Previously bringing water from Lake Michigan had been estimated to cost $2,000,000, and was voted down. Two years ago Mayor Geo. E. Ellis appointed another commission which employed Messrs. Hering and Fuller of New York to report upon filtration, and they strongly recommended mechanical filtration, including sterilization with hypochlorite of lime, and softening. In connection with the last the engineers recommended softening the Grand River water to the "Lake Michigan standard" of 150 parts (the hardness of the water of that lake) with a consequent saving in cost. A hardness of about 75 parts, which is a very soft water, is the ordinary standard for municipal softening plants. This would involve the retention by the water of the sulphate hardness or incrustants, but it would save, in the operating expenses, the cost of the soda, which is much more expensive than lime, while the use of the latter material only would suffice to reduce the carbonate hardness. There is an additional advantage in the omission of the soda treatment, since the removal of the matter thrown into suspension by the soda may require several hours where that due to lime could practically all be removed in a few minutes.

The plant will include an intake and low lift pumping station about one-half mile up river from the existing pumping station; four motor-driven centrifugal pumps, each of eight million gallons capacity, raising the water onto the filters. These pumps will be driven by power from the municipal electric lighting plant. The settling and coagulating basins will be in four units with a total capacity of 5½ million gallons. In connection with the softening there will be reaction chambers of one million gallons capacity, in which the water will be mixed and kept flowing at fairly high velocity for an hour. The filter proper will contain 5,760 sq. ft. in at least 8 units. A 48-inch conduit will bring the purified water to the main pumping station.

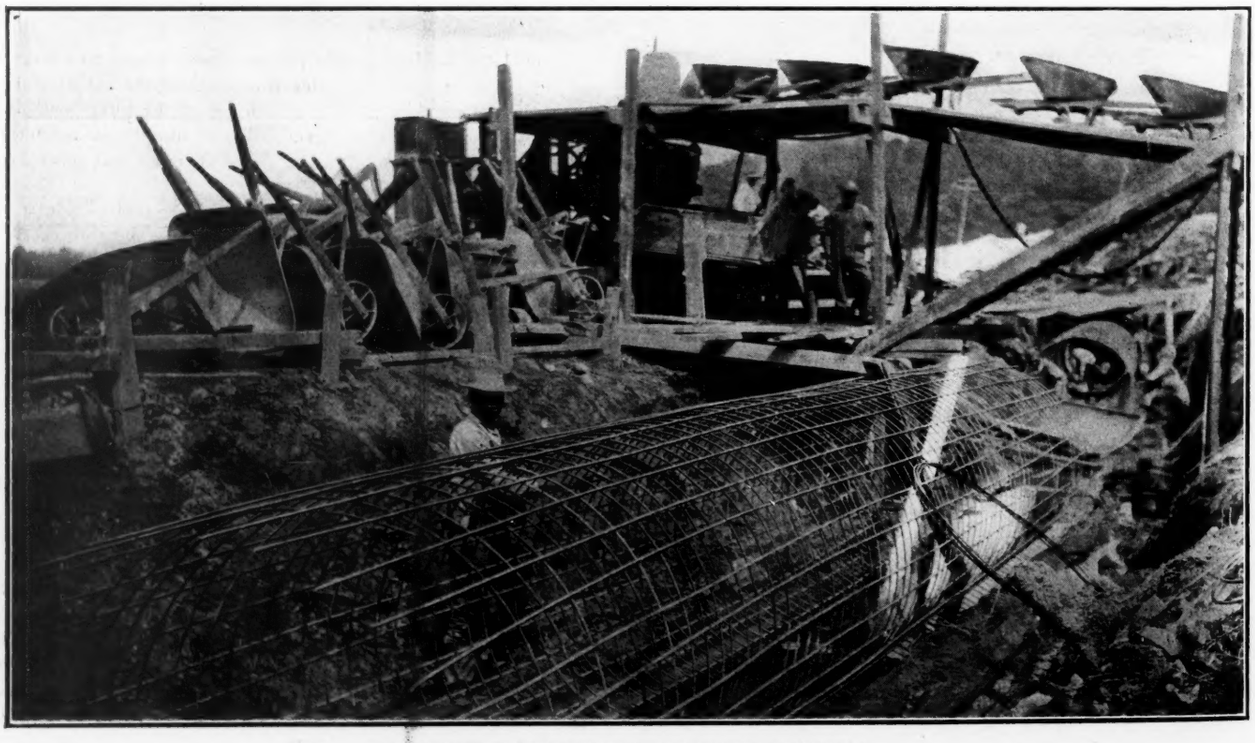


FIG. 7—REINFORCEMENT FOR NEW CONDUIT

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J. H. DONNELLY, F. E. PUFFER, Assistant Editors

Business Department
S. W. HUME, President
J. T. MORRIS, Manager A. PRESCOTT FOLWELL, Secretary

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APRIL 20, 1910.

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Disinfecting Water Supplies

FULLY 100 water works plants, both private and municipal, have made a more or less extensive use of bleaching powder as a disinfectant during the past year. A considerable percentage of these, however, have not published the fact and are not at all anxious that it should be known. This probably is especially true in the case of municipal plants, where there exists among the citizens, in addition to the ordinary motives for criticism, the additional one of politics. Opposition to the use of bleaching powder is based most largely upon two lines of argument—the first being that it is a poisonous or at least a harmful substance, the use of which in drinking water may be injurious to the health of the consumers. The other, which has occasionally been advanced, is that its use is a confession that the filtration plant previously used has proven a failure and that a disinfectant is added to conceal this, or that the administration finds it easier to use the disinfectant than to operate the filter properly.

As a matter of fact, the minute quantities of bleaching powder which are used could not, it is believed, produce any effect whatever on the thirstiest consumer possible of the water treated. As to the second objection, whether the filter is acting successfully or not, the disinfectant furnishes an additional safeguard against the distribution of pathogenic bacteria (which after all are the impurities which it is most essential to remove), and at slight expense.

This disinfectant has been employed in a number of cases where there is no filtration plant and in which an epidemic of typhoid fever has called for immediate action. And as disinfecting the water requires no elaborate apparatus, but can be applied by simple contrivances which can be installed in a few hours, it would seem almost criminal not to employ it in such an emergency. Within the past few months it has been used in this way at Montreal, where the conditions were quite serious, at Ridgewood, N. J., and many other cities. Minneapolis, Nashville and Yonkers are among those which have used it. Poughkeepsie, N. Y., was one of the first cities to adopt it. It has been recommended by Hering and Fuller for use at Niagara Falls, at least temporarily, one of the water supplies of which city is considered to be as seriously polluted as almost any in the country. Instances where it has been installed by Dr. J. L. Leal are described elsewhere in this issue.

One feature in connection with the use of disinfectants which deserves careful consideration is the fact that the disinfectant to a greater or less extent inhibits the growth of bacteria in sand filters when the disinfected water is passed through them. At Poughkeepsie, N. Y. (which plant and the use of disinfectant were described in our issue of Jan. 26), the chloride of lime treatment has been continued at all times for over a year. Concerning the effect upon the sand filters, which receive the water after treatment with chloride of lime, Superintendent Robt. J. Harding writes us: "There are some very interesting features in regard to disinfection of sand in our filter beds, which we are just investigating. From the few observations which we have taken we find the top of the bed is practically sterile. The growth of 20 degree bacteria, which are harmless, occurs lower down in the bed, which makes our filtered water counts a great deal higher than those of the applied water. However, the 37 degree counts are always removed." Concerning the efficiency of the use of bleaching powder, Mr. Harding states that there have been no cases of typhoid fever or intestinal diseases of any kind in the city since Dec. 1, 1909, and the previous year broke all records for the small number of cases of this kind.

Another city which recently put new sand filters into service is said to have treated the water with disinfectant before filtering it from the very beginning of the use of the filter; with the result that the oxidizing bacteria failed to develop in the filter, which consequently served as a mere strainer and gave low efficiency.

One reason for the increasing use of disinfectants, aside from the fact of the recent discovering of its effectiveness, is that many of the newer filtration plants are provided with pre-filters. While these preliminary clarifying processes permit higher rates of filtration in the final filters, they also remove a considerable part of the suspended matter which would otherwise collect on and in the sand filter, partly as "schmutzdecke." This fine material, collecting in the filter, increases greatly the power of the same to strain out bacteria and other microscopic suspended matter; and when it is absent these are much more likely to pass out with the effluent. It follows, therefore, that while pre-filtration is of considerable assistance in purifying a muddy water, it reduces the germicidal effects of the filter and therefore makes desirable some further treatment of the bacteria, such as the use of a disinfectant.

While heat and acid have been suggested for sterilizing water, we believe the only methods used in actual practice have been those employing oxygen, the effect of hypochlorides being really due to the nascent oxygen. Ozone, or "vitalized oxygen," has been employed in a number of small private or industrial plants and in a few municipal ones. The use of this is referred to elsewhere in this issue.

STATISTICS OF WATER WORKS PLANTS IN CITIES

Seventy-four Per Cent of these Operate Municipal Plants—Sources and Amounts of Supplies—Lengths Dollars—Earnings, Expenses and Profits, Total Per Capita and

City	Ownership	Source of Supply	Million Gallons Supplied to Pipes	Length of Main Pipes in Miles	Total Number of Fire Hydrants	Water Pressure at Hydrants, Pounds to Square Inch	Net Cost of System	Present Value of System	Collections For Services to Public
New York, N. Y.	City and private	Rivers, streams and wells	179,018	[2]2,315.0	36,541	15 to 60	$147,196,000	$128,325,606	$10,563,404
Chicago, Ill.	City	Lake Michigan	166,980	2,153.0	22,127	25 to 40	45,999,084	38,871,166	4,649,335
Philadelphia, Pa.	City	Delaware river	110,389	1,558.2	14,852	100 to 300	70,033,874	65,000,000	4,017,294
St. Louis, Mo.	City	Mississippi river	28,048	843.1	9,631	30 to 80	25,873,900	25,873,900	1,943,059
Boston, Mass.	City	Lake and rivers	35,194	748.3	8,142	40	17,074,859	15,500,000	2,626,247
Baltimore, Md.	City	Gunpowder river& Jones Falls	26,180	684.0	2,760	20 to 110	13,553,908	13,553,908	1,018,537
Pittsburg, Pa.	City and private	Allegh'y & Monongahela riv'rs	40,430	631.0	6,067	20 to 220	21,160,277	21,160,277	1,425,531
Cleveland, O.	City	Lake Erie	21,491	689.9	8,152	35	14,850,589	14,947,204	1,164,969
Buffalo, N. Y.	City	Niagara river	48,451	529.9	5,025	30 to 40	9,116,715	9,116,715	751,606
San Francisco, Cal.	Private	Lakes and springs	.....	.....	4,138	55	.....	.....	.....
Detroit, Mich.	City	Lakes and river	26,857	731.2	5,022	12 to 60	8,877,077	8,877,077	663,605
Cincinnati, O.	City	Ohio river	17,582	509.5	3,284	48	19,325,738	14,560,002	1,011,096
Milwaukee, Wis.	City	Lake Michigan	12,312	418.4	3,095	40 to 55	5,894,291	5,900,000	559,525
New Orlaens, La.	Private	River	[17]	[17]159.6	1,810	40	[17]3,344,723	[17]3,344,723	.....
Washington, D. C.	City	Potomac river	8,342	476.2	2,422	75 to 80	18,385,252	16,140,054	511,896
Newark, N. J.	City	Passaic river	13,059	366.8	2,705	30 to 130	11,140,176	20,000,000	1,067,292
Minneapolis, Minn.	City	Mississippi river	6,420	348.7	4,019	98	6,108,793	6,108,793	337,547
Jersey City, N. J.	Private	Rockaway river	14,146	228.6	2,841	40	8,001,046	6,000,000	1,106,142
Louisville, Ky.	City	Ohio river	9,126	305.9	632	70	8,959,763	8,000,000	582,978
Indianapolis, Ind.[18]	City and private	White river	[19]	4.8	2,410	83	30,500	30,500	4,079
St. Paul, Minn.	City	Lakes	3,935	298.0	2,773	44	4,740,295	7,000,000	336,211
Providence, R. I.	City	Pawtuxet river	5,923	366.2	2,105	65 to 114	7,379,615	4,428,087	694,323
Rochester, N. Y.	City	River and lake	6,065	333.6	3,648	60	8,673,208	8,360,227	541,355
Kansas City, Mo.	City	Missouri river	7,973	371.2	4,546	30 to 125	6,810,171	10,000,000	785,471
Toledo, O.	City	Maumee river	4,300	217.0	1,642	45 to 75	2,179,337	2,225,000	238,246
Denver, Col.[9]	Private	Platte river	[19]	55.0	3,232	90	160,000	165,000	11,869
Columbus, O.	City	Rivers	5,942	224.8	1,870	55	4,525,506	4,525,506	243,260
Los Angeles, Cal.	City	River and wells	11,315	657.9	2,048	90	8,644,350	7,742,699	1,035,406
Worcester, Mass.	City	Brooks	3,443	202.4	2,051	60 to 130	4,495,333	4,572,761	379,255
Seattle, Wash.	City	Cedar river	8,213	370.6	2,250	55 to 115	4,747,930	5,201,878	640,997
Memphis, Tenn.	City	Artesian wells	5,040	179.5	1,137	45	2,988,310	4,000,000	347,633
Omaha, Neb.	Private	Missouri river	.....	.....	1,533	60 to 120	.....	.....	.....
New Haven, Conn.	Private	Lakes and rivers	.....	.....	1,265	31 to 45	.....	.....	.....
Scranton, Pa.	Private	Mountain streams and springs	.....	.....	872	70 to 125	.....	.....	.....
Syracuse, N. Y.	City	Skaneateles Lake	4,397	204.4	2,902	95 to 100	5,500,000	4,719,627	307,749
St. Joseph, Mo.	Private	Missouri river	.....	.....	897	30 to 120	.....	.....	.....
Paterson, N. J.	Private	River	.....	.....	1,372	45	.....	.....	.....
Portland, Ore.	City	Lake	5,840	332.5	1,056	10 to 100	5,521,292	7,695,710	557,416
Atlanta, Ga.	City	River	5,101	183.0	1,742	40 to 90	4,212,492	4,212,492	325,988
Richmond, Va.	City	James river and canal	4,555	123.0	810	10 to 60	2,970,310	3,500,000	194,237
Fall River, Mass.	City	North Watuppa pond	1,805	104.5	1,191	80	2,118,102	2,012,900	210,839
Nashville, Tenn.	City	Cumberland river	6,085	114.8	979	30 to 90	3,208,800	5,000,000	229,864
Dayton, O.	City	River	2,751	164.7	1,867	60 to 100	2,217,624	2,050,000	155,812
Grand Rapids, Mich.	City	River	5,391	172.6	1,658	63 to 85	1,902,663	1,420,042	165,018
Cambridge, Mass.	City	Brooks	4,039	129.0	1,067	55 to 60	6,426,382	6,426,382	384,123
Albany, N. Y.	City	Rivers and streams	7,803	136.0	899	57 to 65	3,946,680	2,262,610	361,642
Hartford, Conn.	City	Streams	2,533	144.3	1,204	70 to 89	3,700,000	3,127,176	265,750
Lowell, Mass.	City	River	2,017	143.9	1,299	50	3,089,169	4,375,888	215,189
Reading, Pa.	City	Creeks and springs	4,481	112.3	933	40 to 90	2,893,753	3,060,934	230,117
Trenton, N. J.	City	River	5,206	130.0	925	20 to 45	2,346,726	2,346,726	206,743
Bridgeport, Conn.	Private	Lakes, brooks and springs	.....	.....	891	46 to 60	.....	.....	.....
Wilmington, Del.	City	Brandywine river	3,236	122.0	902	15 to 70	2,500,000	2,500,000	210,996
Camden, N. J.	City	Wells and Delaware river	4,677	97.1	923	25 to 30	2,585,000	2,585,000	239,076
Des Moines, Ia.	Private	Raccoon river	.....	.....	1,400	100	.....	.....	.....
Kansas City, Kan.	Private	Missouri river	.....	.....	468	10 to 100	.....	.....	.....
Lynn, Mass.	City	Ponds	2,196	139.0	858	60	2,966,120	3,000,000	294,271
New Bedford, Mass.	City	Ponds	2,712	110.0	1,153	56 to 63	3,400,923	2,531,201	229,624
Springfield, Mass.	City	Streams, springs and ponds	3,635	160.4	1,234	72	2,572,054	2,432,119	293,264
Troy, N. Y.	City	Hudson river	4,500	105.8	1,032	50 to 60	3,415,981	4,500,000	177,515
Oakland, Cal.	Private	Lakes and wells	.....	.....	628	35 to 50	.....	.....	.....
Lawrence, Mass.	City	Merrimac river	1,282	90.8	871	65 to 125	2,243,994	1,347,674	125,828
Somerville, Mass.	City	River	2,390	92.1	1,072	60 to 95	891,738	945,331	233,814
Savannah, Ga.	City	13 artesian wells	3,145	67.5	666	22	1,142,000	1,142,000	114,512
Duluth, Minn.	City	Lake Superior	2,080	94.9	669	40 to 120	2,493,267	2,600,000	173,242
Norfolk, Va.	City	Rivers	2,482	89.3	505	40	1,343,990	2,000,000	168,898
Hoboken, N. J.	City	Hackensack river	1,788	26.0	360	40 to 50	484,120	500,000	220,810
Peoria, Ill.	Private	Wells	.....	.....	1,251	90 to 125	.....	.....	.....
Yonkers, N. Y.	City	Wells	2,908	111.7	1,195	125	2,402,746	3,500,000	180,109
Utica, N. Y.	Private	Springs and streams	.....	.....	1,137	85 to 100	.....	.....	.....
Manchester, N. H.	City	Lake	1,182	111.0	837	60	1,928,825	1,928,825	120,193
Schenectady, N. Y.	City	Artesian wells	2,846	79.0	1,299	90 to 100	1,012,161	1,053,661	128,856
Evansville, Ind.	City	River	2,815	82.4	601	45 to 100	1,079,773	1,079,773	111,479
San Antonio, Tex.	Private	Artesian wells	.....	.....	1,156	75 to 90	.....	.....	.....
Elizabeth, N. J.	Private	River	.....	.....	399	15 to 80	.....	.....	.....
Waterbury, Conn.	City	Lakes	2,498	76.2	716	110 to 115	1,983,000	2,548,000	185,516
Salt Lake City, Utah.	City	Creeks	6,935	163.8	1,310	95	5,611,593	5,611,593	153,217
Wilkes-Barre, Pa.	Private	Springs	.....	.....	301	20 to 60	.....	.....	.....
Erie, Pa.	City	Lake Erie	4,326	125.0	820	60	3,831,121	4,000,000	196,676
Houston, Tex.	City	Artesian wells	2,920	69.0	610	45 to 50	955,296	954,791	172,915
Tacoma, Wash.	City and private	Creek and wells	2,046	188.6	725	30 to 200	2,069,204	2,500,000	257,801
Harrisburg, Pa.	City	Susquehanna river	3,970	60.5	794	29 to 67	1,250,000	2,450,000	213,054
Charleston, S. C.	Private	River	.....	.....	601	50	.....	.....	.....
Portland, Me.	Private	Sebago Lake	.....	.....	640	50 to 75	.....	.....	.....
Youngstown, O.	City	River	2,085	104.9	1,150	85 to 90	1,100,000	1,473,826	135,407
Dallas, Tex.	City	Trinity river	3,138	160.0	838	40 to 52	1,789,389	2,050,000	205,544
Terre Haute, Ind.	Private	Wabash river	.....	.....	963	105 to 115	.....	.....	.....
Fort Wayne, Ind.	City	Wells	1,438	96.4	778	45	995,438	1,600,000	97,247
Akron, O.	Private	Lakes and wells	.....	.....	555	85	.....	.....	.....
Holyoke, Mass.	City	River	1,923	89.7	918	80	1,327,808	1,301,252	116,326
Brockton, Mass.	City	Silver Lake	738	103.7	909	56 to 65	1,712,699	1,712,699	121,138
Covington, Ky.	City	Ohio river	1,128	46.5	403	120	1,698,935	1,675,000	113,194
Saginaw, Mich.	City	River	3,167	98.1	880	50 to 115	970,511	909,260	77,603
Lincoln, Neb.	City	Wells	750	68.5	598	45 to 120	674,956	1,503,850	83,643

For foot notes see pages 578 and 579.

OF MORE THAN THIRTY THOUSAND POPULATION

of Mains and Numbers of Fire Hydrants—Cost and Present Value—Latter Seven Hundred Million Per Million Gallons—Profits and Losses of Municipal Operation

CITY	Value of Services to City (Estimated)	Annual Rental Per Fire Hydrant	EXPENSES OF OPERATION				TOTAL EARNINGS OVER		PER CAPITA			AVERAGES PER MILLION GALLONS SUPPLIED TO PIPES		
			Total Expenses of Operation	Payments for Salaries, Wages and Miscel'ous Objects	OTHER EXPENSES (ESTIMATED)		Total Costs of Services	Total Expenses of Operation	Earnings	Expenses of Operation	Interest	Earnings	Expenses of Operation	Interest
					Depreciation	Taxes								
New York, N. Y.	$1,859,300	[1]	$8,109,912	$3,619,799	$2,566,512	$1,923,601	[10]$255,600	$4,312,792	$2.94	$1.92	$1.08	$69.39	$45.30	$25.52
Chicago, Ill.	927,353	[2]$40.00	2,709,107	1,536,364	777,423	395,320	1,192,234	2,867,581	2.65	1.29	0.79	33.40	16.22	10.03
Philadelphia, Pa.	645,220	[3]	4,260,105	2,011,105	1,300,000	949,000	[10]1,807,591	402,409	3.18	2.91	1.51	42.24	38.59	20.02
St. Louis, Mo.	291,133	[3]	1,730,319	978,423	517,478	234,418	[10]507,796	503,873	3.38	2.62	1.53	79.66	61.69	36.07
Boston, Mass.	268,037	.....	1,492,152	952,752	310,000	229,400	932,482	1,402,132	4.75	2.45	0.77	82.24	42.40	13.34
Baltimore, Md.	246,893	[3]	952,232	409,428	271,078	261,726	[10]287,240	313,198	2.26	1.70	1.07	48.34	36.37	22.93
Pittsburg, Pa.	233,872	30.00	1,435,167	748,727	423,206	263,234	[10]543,882	224,236	3.12	2.70	1.45	41.04	35.50	19.00
Cleveland, O.	209,380	.....	1,114,113	530,425	298,944	284,744	[10]339,147	260,236	2.89	2.34	1.26	63.95	51.84	27.89
Buffalo, N. Y.	170,159	15.00	943,222	614,474	182,334	146,414	[10]380,656	[15]21,457	2.38	2.44	0.93	19.02	19.47	7.41
San Francisco, Cal.	.....	30.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit, Mich.	161,697	.....	511,703	197,987	177,542	136,174	[10]7,751	313,599	2.25	1.39	0.87	30.73	19.05	11.97
Cincinnati, O.	152,734	.....	1,046,950	512,744	291,200	243,006	[10]391,264	116,880	3.35	3.02	1.46	66.19	59.55	28.90
Milwaukee, Wis.	141,906	3.00	394,066	202,198	118,000	73,868	31,245	307,365	2.17	1.22	0.86	56.98	32.01	22.43
New Orleans, La.	.....	60.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington, D. C.	275,042	.....	884,739	395,373	322,801	166,565	[10]678,843	[15]97,801	2.52	2.83	1.86	94.33	106.06	69.65
Newark, N. J.	136,150	.....	845,899	213,099	400,000	232,800	[10]426,457	357,543	4.07	2.86	2.65	92.15	64.78	60.04
Minneapolis, Minn.	131,411	[3]	378,576	174,664	122,176	81,736	[10]153,359	90,382	1.64	1.33	0.85	73.05	58.97	37.97
Jersey City, N. J.	111,874	[3]	740,544	551,304	120,000	69,240	194,272	477,472	5.01	3.04	1.16	86.10	52.35	20.02
Louisville, Ky.	105,616	.....	337,356	76,556	160,000	100,800	4,038	351,238	3.00	1.47	1.51	75.45	36.97	38.05
Indianapolis, Ind.	650	45.00	5,250	4,320	610	320	[10]2,351	[15]521	[22]	[22]	[22]	[23]	[23]	[23]
St. Paul, Minn.	96,879	[2]25.00	330,203	119,643	140,000	70,560	[10]219,113	102,887	2.06	1.57	1.53	110.06	83.91	81.83
Providence, R. I.	95,611	[4]	548,204	394,550	88,562	65,092	92,832	241,730	3.80	2.64	0.72	133.37	92.56	25.14
Rochester, N. Y.	87,117	30.00	493,281	198,833	167,205	127,243	[10]159,925	135,191	3.32	2.60	1.56	103.62	81.33	48.66
Kansas City, Mo.	85,320	[2]40.00	613,659	295,659	200,000	118,000	[10]177,868	257,132	4.69	3.31	2.35	109.22	76.97	54.56
Toledo, O.	75,750	.....	173,616	98,878	44,500	30,238	46,708	140,380	1.91	1.05	0.57	73.02	40.38	21.78
Denver, Col.	[19]	[5]	9,542	4,062	3,300	2,180	[10]5,923	2,327	[22]	[22]	[22]	[23]	[23]	[23]
Columbus, O.	68,412	.....	277,899	124,213	90,510	63,176	[10]148,152	33,773	2.10	1.87	1.22	52.45	46.77	30.62
Los Angeles, Cal.	77,730	.....	402,791	200,552	154,854	47,385	418,445	710,345	[25]	[25]	[25]	98.38	35.60	25.80
Worcester, Mass.	60,729	.....	228,511	74,363	91,455	62,693	50 969	211,473	3.33	1.73	1.22	127.83	66.39	46.63
Seattle, Wash.	74,763	.....	302,182	130,155	104,038	67,989	156,605	413,578	[25]	[25]	[25]	87.15	36.79	31.29
Memphis, Tenn.	59,248	.....	314,701	177,421	80,000	57,280	[10]95,020	92,180	3.16	2.44	1.45	80.73	62.44	37.14
Omaha, Neb.	.....	[6]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Haven, Conn.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Scranton, Pa.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Syracuse, N. Y.	55,490	[2]25.00	268,158	98,015	94,393	75,750	[10]72,938	95,081	3.01	2.22	1.39	82.61	60.99	38.21
St. Joseph, Mo.	.....	40.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Paterson, N. J.	.....	[7]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portland, Ore.	51,868	.....	292,759	104,445	153,914	34,400	[10]74,417	316,525	5.40	2.60	3.47	104.33	50.13	66.94
Atlanta, Ga.	49,342	.....	291,022	175,178	84,250	31,594	[10]88,404	84,308	3.50	2.71	1.61	73.58	57.05	33.86
Richmond, Va.	48,864	.....	171,158	59,648	70,000	41,510	[10]50,557	71,943	2.29	1.61	1.15	53.37	37.58	26.89
Fall River, Mass.	48,816	.....	137,278	65,599	40,258	31,421	42,062	122,377	2.45	1.29	0.76	143.85	76.05	44.50
Nashville, Tenn.	48,428	30.00	267,259	112,959	100,000	54,300	[10]240 967	11,033	2.64	2.54	2.39	45.73	43.92	41.41
Dayton, O.	47,494	.....	154,101	84,319	41,000	28,782	[10]36,280	49,205	1.97	1.49	0.83	73.90	56.02	31.07
Grand Rapids, Mich.	46,843	[8]	108,060	66,623	28,401	13,036	41,177	103,801	2.08	1.06	0.61	39.30	20.04	11.62
Cambridge, Mass.	47,833	.....	309,152	73,689	128,528	106,935	[10]125,254	122,804	4.33	3.10	2.49	106.95	76.54	61.42
Albany, N. Y.	47,649	[2]20.00	234,873	154,505	45,252	35,116	81,651	174,418	4.12	2.37	0.93	52.45	30.10	11.89
Hartford, Conn.	47,272	15.00	210,149	97,414	62,544	50,191	[10]22,214	102,873	3.18	2.13	1.27	123.58	82.96	49.38
Lowell, Mass.	45,675	.....	306,081	143,385	87,518	75,178	[10]220,253	[15]45,217	2.74	3.22	1.84	129.33	151.75	86.78
Reading, Pa.	44,722	.....	162,694	69,335	61,219	32,140	[10]10,292	112,145	2.95	1.75	1.31	61.33	36.31	27.32
Trenton, N. J.	42,494	.....	138,306	69,218	46,935	22,153	18,235	110,931	2.82	1.56	1.05	47.87	26.57	17.81
Bridgeport, Conn.	.....	12.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wilmington, Del.	41,482	40.00	157,695	80,770	50,000	26,925	[10]6,217	94,783	2.92	1.82	1.82	78.02	48.73	31.21
Camden, N. J.	41,440	.....	199,769	119,375	51,700	28,694	[10]25,238	80,747	3.25	2.31	1.23	59.98	42.71	22.66
Des Moines, Ia.	.....	45.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kansas City, Kan.	.....	50.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lynn, Mass.	38,617	.....	227,526	120,306	60,000	47,220	[10]9,238	105,362	4.14	2.83	1.42	151.59	103.61	52.19
New Bedford, Mass.	37,982	.....	138,528	49,658	50,624	38,246	22,768	129,078	3.38	1.75	1.34	98.67	51.08	39.20
Springfield, Mass.	37,503	25.00	212,902	138,674	48,642	25,586	22,526	117,865	4.23	2.72	1.22	91.00	58.57	26.23
Troy, N. Y.	36,843	.....	271,692	100,512	90,000	81,180	[10]229,234	[15]57,334	2.79	3.54	2.24	47.64	60.38	38.20
Oakland, Cal.	.....	36.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lawrence, Mass.	35,062	.....	117,856	71,739	26,953	19,164	[10]10,873	43,034	2.20	1.61	0.74	125.50	91.93	42.05
Somerville, Mass.	34,715	.....	88,685	55,362	18,907	14,416	142,031	179,844	3.71	1.23	0.52	112.36	37.11	15.82
Savannah, Ga.	33,542	.....	76,806	42,066	22,840	11,900	14,148	71,248	2.12	1.10	0.82	47.08	24.42	18.16
Duluth, Minn.	33,471	[13]	149,157	66,373	52,000	30,784	[10]55,544	57,556	2.96	2.14	1.62	99.38	71.71	54.38
Norfolk, Va.	32,894	.....	135,063	73,823	40,000	21,240	[10]17,271	66,729	2.94	1.97	1.23	81.30	54.42	33.84
Hoboken, N. J.	32,500	.....	243,014	228,254	10,000	4,760	[10]12,204	10,296	3.74	3.59	0.33	141.59	135.84	12.58
Peoria, Ill.	.....	[14]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Yonkers, N. Y.	32,067	.....	234,823	104,658	70,000	60,165	[10]181,547	[15]22,647	3.18	3.52	2.38	72.96	80.75	54.64
Utica, N. Y.	.....	[2]30.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Manchester, N. H.	31,675	25.00	100,422	33,897	38,576	27,949	[10]29,758	51,446	2.30	1.52	1.23	128.48	84.96	68.70
Schenectady, N. Y.	31,500	[2]30.00	84,807	51,375	21,073	12,359	34,562	75,549	2.44	1.29	0.62	56.34	29.80	14.40
Evansville, Ind.	31,335	.....	95,987	60,031	21,595	14,361	[10]17,959	46,827	2.19	1.47	0.99	50.73	34.10	23.01
San Antonio, Tex.	.....	[16]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Elizabeth, N. J.	.....	15.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Waterbury, Conn.	30,574	.....	105,462	25,455	50,960	29,047	11,511	110,628	3.39	1.66	1.56	86.47	42.20	39.66
Salt Lake City, Utah.	29,864	.....	280,778	80,949	112,232	87,597	[10]322,161	[15]97,697	2.94	4.51	3.61	26.40	40.49	32.37
Wilkes-Barre, Pa.	.....	20.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Erie, Pa.	29,377	[2]40.00	236,872	104,072	80,000	52,800	[10]170,819	[15]10,819	3.69	3.87	2.61	52.25	54.76	36.99
Houston, Tex.	28,782	.....	101,783	74,094	19,096	8,593	52,174	99,914	3.36	1.70	0.80	69.07	34.86	16.35
Tacoma, Wash.	35,294	4.00	174,530	90,280	50,000	34,250	[10]6,435	118,565	[25]	[25]	[25]	143.25	85.30	61.09
Harrisburg, Pa.	27,198	[26]	142,158	68,119	49,000	25,039	6,709	98,094	4.24	2.51	1.61	60.50	35.81	23.02
Charleston, S. C.	.....	40.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portland, Me.	.....	[27]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown, O.	26,113	[2]45.00	118,847	76,872	29,477	12,498	[10]24,681	42,673	2.97	2.18	1.24	77.47	57.00	32.30
Dallas, Tex.	26,082	35.00	154,128	87,421	41,000	25,707	[10]20,697	77,498	4.26	2.84	1.81	73.81	49.12	31.29
Terre Haute, Ind.	.....	40.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fort Wayne, Ind.	25,065	[2]50.00	109,623	59,415	32,000	18,208	[10]45,391	12,689	2.34	2.10	1.11	85.06	76.23	40.39
Akron, O.	.....	40.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Holyoke, Mass.	24,779	8.00	100,849	54,824	26,025	20,000	[10]10,883	40,256	2.73	1.95	0.99	73.38	52.44	26.59
Brockton, Mass.	24,425	.....	105,340	41,199	34,254	29,887	[10]25,373	40,223	2.86	2.07	1.29	197.24	142.74	88.88
Covington, Ky.	24,238	.....	98,268	43,077	33,500	21,691	[10]27,836	39,164	2.72	1.95	1.33	121.84	87.12	59.40
Saginaw, Mich.	24,904	.....	76,911	40,068	18,185	18,658	[10]10,593	25,596	2.06	1.54	0.73	32.37	24.29	11.43
Lincoln, Neb.	24,795	[2]50.00	88,849	41,974	30,077	16,798	[10]44,625	19,589	2.19	1.79	1.29	144.58	118.47	85.62

For foot notes see pages 578 and 579.

STATISTICS OF WATER WORKS PLANTS IN CITIES

(*Continued.*)

CITY	Ownership	Source of Supply	Million Gallons Supplied to Pipes	Length of Main Pipes in Miles	Total Number of Fire Hydrants	Water Pressure at Hydrants, Pounds to Square Inch	Net Cost of System	Present Value of System	Collections For Services ➡ to Public
Altoona, Pa.	City	Streams	1,460	69.6	599	18 to 95	$1,088,059	[5]2,100,000	$110,421
Spokane, Wash.	City	River	5,313	161.0	1,025	30 to 100	2,270,583	2,338,749	345,504
Lancaster, Pa.	City	Creek	2,339	66.5	609	30 to 70	1,267,040	1,275,000	120,919
Birmingham, Ala.	Private	River			401	85			
Bayonne, N. J.[11]	Private	River	1,327	44.5	498	40	434,734	434,734	224,226
South Bend, Ind.	City	Wells	1,761	80.8	859	75	926,270	926,270	82,571
Butte, Mont.	Private	Creeks			463	90 to 180			
Pawtucket, R. I.	City	Streams	3,297	161.8	636	110	2,114,047	2,114,047	214,851
McKeesport, Pa.	City	Youghiogheny river	1,771	58.8	418	70 to 150	769,240	1,000,000	71,750
Binghamton, N. Y.	City	Susquehanna river	2,411	85.0	795	60 to 80	1,251,715	1,041,943	120,894
Johnstown, Pa.	Private	Streams			204	50			
Dubuque, Ia.	City	Mississippi river	1,175	45.0	364	45	618,565	800,000	56,425
Sioux City, Ia.	City	Wells and river	629	68.5	361	100	612,715	612,715	73,232
Augusta, Ga.	City	Savannah river	2,984	61.4	763	73	1,193,119	1,193,119	76,393
Mobile, Ala.	City	Creeks	3,565	138.4	629	81	1,038,306	1,500,000	110,412
Topeka, Kan.	City	Wells	837	56.3	409	60	690,417	685,000	84,542
Springfield, O.	City	River	1,448	76.0	584	65	920,000	1,300,000	70,268
Allentown, Pa.	City	Springs	2,622	61.1	436	40 to 105	736,600	736,600	97,236
East St. Louis, Ill.	Private	Mississippi river			435	65 to 80			
Wheeling, W. Va.	City	Ohio river	6,095	45.0	417	55	1,250.000	2,000,000	149,380
Montgomery, Ala.	City	Artesian wells	1,232	85.0	691	90 to 100	868,961	1,545,000	83,992
Passaic, N. J.	Private	Passaic river			407	19 to 80			
Davenport, Ia.	Private	River			669	120			
Atlantic City, N. J.	City	Artesian wells and pond	2,144	80.0	725	40	1,459,265	1,275,000	146,676
Little Rock, Ark.	Private	R ver			395	80			
Bay City, Mich.	City	River	2,268	80.0	720	40	986,388	780,810	53,049
York, Pa.	Private	Streams			297	80			
Malden, Mass.	City	Streams	373	84.0	436	56 to 112	874,240	874,240	91,548
Springfield, Ill.	City	River	1,735	76.2	596	25 to 40	1,057,044	676,837	111,859
Quincy, Ill.	Private	River			372	35 to 40			
Canton, O.	City	Artesian wells	2,010	84.3	518	80	849,469	1,000,000	73,414
Superior, Wis.	Private	Lake Superior			648	60 to 70			
Chester, Pa.	Private	Delaware river			176	60 to 70			
Chelsea, Mass.	City	Lake and rivers	1,373	40.0	323	55	515,880	462,000	136,518
South Omaha, Neb.	Private	Missouri river			372	92			
Newcastle, Pa.	Private	Streams			372	85 to 90			
Salem, Mass.	City	Lake	1,227	65.5	528	55	1,952,586	1,952,586	98,576
Newton, Mass.	City	Wells	846	142.2	979	115	2,259,668	1,500,000	156,957
Haverhill, Mass.	City	Lakes	1,841	84.0	357	110 to 120	1,446,595	1,446,595	105,294
Jacksonville, Fla.	City	Artesian wells	1,105	60.6	637	60	611,057	1,000,000	81,803
Joplin, Mo.	Private	Creek			277	40			
Wichita, Kan.	Private	Wells			314	45 to 80			
Rockford, Ill.	City	Artesian wells	1,316	82.3	476	61	773,083	773,083	76,981
Knoxville, Tenn.	Private	River			267	40			
Elmira, N. Y.	Private	River			497	30			
Galveston, Tex.	City	Artesian wells	1,114	51.2	502	40	1,500,000	1,500,000	120,901
New Britain, Conn.	City	Lake	1,650	82.0	578	80 to 90	1,685,000	2,162,600	106,464
Chattanooga, Tenn.	Private	River			311	65			
Kalamazoo, Mich.	City	Wells	542	68.3	584	60	475,000	425,000	39,107
Woonsocket, R. I.	City	Brook	491	53.8	630	106	997,190	1,119,630	79,590
Fitchburg, Mass.	City	Brooks and ponds	1,062	74.4	604	110	1,500,000	1,254,023	81,966
Racine, Wis.	Private	Lake			558	65			
Auburn, N. Y.	City	Lake	2,293	70.0	760	40 to 50	842,148	715,708	92,473
Macon, Ga.	Private	River			246	40			
Joliet, Ill.	City	Wells	1,095	37.5	317	25 to 28	432,846	625,000	30,022
Oklahoma City, Okla.	City	River	1,095	58.4	508	55	592,412	750,000	78,808
Oshkosh, Wis.	Private	Lake			444	50			
West Hoboken, N. J.	Private	River			202	35 to 45			
Sacramento, Cal.	City	River	[10]	54.6	508	40	2,065,160	2,065,160	126,743
Pueblo, Col.	City	River	[28]2,495	138.9	739	75 to 100	1,750,000	2,450,000	197,999
Everett, Mass.	City	Rivers	932	45.7	517	75	771,464	410,700	90,075
Taunton, Mass.	City	Lakes	777	82.5	886	90 to 100	1,350,065	1,350,065	78,968
Newport, Ky.	City	Ohio river	780	35.5	279	60	756,383	750,000	59,634
La Crosse, Wis.	City	River	993	54.3	506	60 to 110	483,820	609,856	39,162
Fort Worth, Tex.	City	Wells	1,241	86.0	589	65	1,703,625	2,125,000	163,010

[1] In Borough of Brooklyn, $22.50; Borough of Queens, $18.86; Borough of Richmond, $15.40; other boroughs, $18.91. The number of hydrants at each rental not reported.
[2] Estimated.
[3] No record.
[4] City allowed department of public works $30,000 for use of hydrants and for water and other purposes.
[5] 2,504 hydrants at $25 and 728 at $35 each.
[6] 1,225 hydrants at $60, 250 at $84 and 58 at $10 each.
[7] 1,342 hydrants at $30 and 30 at $50 each.
[8] Fire department pays $9,000 per year for water.
[9] This report is for that portion of main pipes owned by city. The system is operated and in large part owned by private corporation.
[10] Excess of total costs of services over total earnings.
[11] City owns distribution system only.
[13] 132 hydrants at $40, 209 at $60, 78 at $75, 130 at $80, and 120 at $100 each.
[14] 12 hydrants at $52, 1,000 at $41.60, 204 at $25 each, and 35 free.
[15] Excess of total expenses of operation over total earnings.
[16] City paid water company $24,000 for all water used by city; hydrant rental not reported separately.
[17] Water supply system not completed.
[18] Report is for a small plant supplying only a portion of the city.
[19] Not reported.

By "net cost" is meant the city's total expenditure upon the system for outlays, including the cost of first acquisition, less the value of any property that may have been sold, and excluding all costs properly charged to operation or maintenance. By "present value" is meant what is known as physical valuation, i.e., the value of the property exclusive of any allowance for franchise, good will or privilege; it is the estimated cost of replacing the system in as good condition as at present. Present value is increased by appreciation in land values and decreased by depreciation allowances. "Earnings" include, in addition to the receipts from the public for services, an estimate of the value of services to the city, computed on the basis of 44 cents per capita for cities of group I, 46 cents

OF MORE THAN THIRTY THOUSAND POPULATION

(Continued.)

CITY	Value of Services to City (Estimated)	Annual Rental Per Fire Hydrant	Expenses of Operation				Total Earnings over		Per Capita			Averages per Million Gallons Supplied to Pipes		
			Total Expenses of Operation	Payments for Salaries, Wages and Miscel'ous Objects	Other Expenses (Estimated)		Total Costs of Services	Total Expenses of Operation	Earnings	Expenses of Operation	Interest	Earnings	Expenses of Operation	Interest
					Depreciation	Taxes								
Altoona, Pa.	$24,439	.....	$79,043	$15,623	$42,000	$21,420	[10]$28,183	$55,817	2.76	1.62	1.72	92.37	54.14	57.53
Spokane, Wash.	30,436	.....	139,068	60,018	46,775	32,275	117,362	236,872	[25]	[25]	[25]	70.76	26.18	22.49
Lancaster, Pa.	24,039	.....	112,618	76,013	25,500	11,105	[10]13,432	32,340	3.02	2.34	0.95	61.97	48.15	19.57
Birmingham, Ala.	.....	$55.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bayonne, N. J.	23,039	.....	189,121	176,109	8,695	4,317	39,537	58,144	5.37	4.10	0.40	186.33	142.52	14.02
South Bend, Ind.	23,002	[24]5.00	61,700	33,495	18,525	9,680	3,117	43,873	2.29	1.34	0.89	59.95	35.04	23.14
Butte, Mont.	.....	50.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pawtucket, R. I.	22,520	[29]	128,459	54,996	42,281	31,182	24,773	108,912	5.27	2.85	1.87	72.00	38.96	25.52
McKeesport, Pa.	22,426	[24]0.00	83,163	52,783	20,000	10,380	[10]32,387	11,013	2.10	1.85	0.97	53.21	46.98	24.52
Binghamton, N. Y.	22,238	[30]	89,221	52,440	20,839	15,942	16,401	53,911	3.22	2.01	0.84	59.37	37.01	15.56
Johnstown, Pa.	.....	[31]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dubuque, Ia.	22,099	[24]0.00	70,340	45,428	16,000	8,912	[10]27,816	8,184	1.78	1.59	0.81	66.83	59.86	30.64
Sioux City, Ia.	22,044	.....	47,911	26,430	12,254	9,227	10,662	47,425	2.16	1.09	0.83	151.57	76.17	58.45
Augusta, Ga.	21,870	.....	52,873	17,080	23,862	11,931	[10]7,346	45,390	2.25	1.21	1.21	32.93	17.72	17.67
Mobile, Ala.	21,821	.....	116,788	74,638	30,000	12,150	[10]46,205	15,445	3.03	2.68	1.41	37.08	32.72	17.29
Topeka, Kan.	21,396	.....	57,404	32,244	13,700	11,460	18,120	48,534	2.48	1.34	0.71	126.57	68.58	36.34
Springfield, O.	21,352	.....	69,618	25,938	26,000	17,680	[10]39,098	22,002	2.15	1.63	1.43	63.27	48.08	42.20
Allentown, Pa.	21,309	.....	55,577	32,426	14,732	8,419	36,524	62,968	2.78	1.30	0.62	45.21	21.20	10.09
East St. Louis, Ill.	.....	[33]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wheeling, W. Va.	20,964	[24]5.00	142,151	89,251	40,000	12,900	[10]61,807	28,193	4.06	3.39	2.15	27.95	23.32	14.77
Montgomery, Ala.	20,924	[34]55.00	80,430	40,847	30,900	8,683	[10]45,039	24,846	2.51	1.92	1.66	85.16	65.28	56.43
Passaic, N. J.	.....	[35]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Davenport, Ia.	.....	38.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atlantic City, N. J.	20,748	.....	132,901	96,589	25,500	10,812	[10]24,382	34,523	4.03	3.20	1.42	78.09	61.99	27.47
Little Rock, Ark.	.....	50.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bay City, Mich.	20,280	.....	62,834	30,376	15,616	16,842	[10]25,813	10,495	1.81	1.55	0.90	32.33	27.70	16.01
York, Pa.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Malden, Mass.	19,893	.....	60,055	28,914	17,485	13,656	17,378	51,386	2.80	1.51	0.85	299.57	161.44	91.42
Springfield, Ill.	19,816	.....	70,898	51,297	13,537	6,064	35,057	60,777	3.32	1.79	0.65	75.89	40.86	14.82
Quincy, Ill.	.....	[36]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Canton, O.	19,486	[24]5.00	60,464	30,314	20,000	10,150	[10]10,864	32,436	2.38	1.55	1.11	46.22	30.08	21.54
Superior, Wis.	.....	40.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chester, Pa.	.....	[37]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chelsea, Mass.	19,288	9.00	42,956	24,647	9,240	9,069	94,370	112,850	4.04	1.11	0.48	113.48	31.29	13.46
South Omaha, Neb.	.....	[38]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Newcastle, Pa.	.....	[39]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Salem, Mass.	19,148	.....	103,413	34,311	39,052	30,050	[10]72,970	14,311	3.07	2.70	2.28	95.94	84.28	71.13
Newton, Mass.	19,062	.....	74,072	22,922	30,000	21,150	42,847	101,947	4.62	1.94	1.55	208.06	87.56	69.86
Haverhill, Mass.	19,046	.....	77,088	25,792	28,932	22,364	[10]10,612	47,252	3.26	2.02	1.52	67.54	41.87	31.43
Jacksonville, Fla.	19,024	.....	86,525	53,835	20,000	12,690	[10]35,698	14,302	2.65	2.27	1.31	91.25	78.30	45.25
Joplin, Mo.	.....	25.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wichita, Kan.	.....	[40]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rockford, Ill.	18,350	[24]0.00	69,087	48,654	15,462	4,971	[10]4,989	26,244	2.60	1.88	0.85	72.44	52.50	23.73
Knoxville, Tenn.	.....	45.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Elmira, N. Y.	.....	[24]5.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Galveston, Tex.	17,612	.....	99,543	51,453	30,000	18,090	[10]36,030	38,970	3.93	2.83	2.13	124.34	89.36	67.32
New Britain, Conn.	17,320	.....	86,297	17,959	43,252	25,086	[10]49,017	37,487	3.57	2.49	2.50	75.02	52.30	52.43
Chattanooga, Tenn.	.....	30.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kalamazoo, Mich.	16,908	.....	34,913	21,929	8,500	4,484	3,677	21,102	1.66	1.03	0.52	103.35	64.42	32.15
Woonsocket, R. I.	16,896	[41]	49,906	16,720	22,393	10,793	2,914	46,580	2.86	1.48	1.29	196.51	101.64	88.93
Fitchburg, Mass.	16,808	[24]5.00	95,433	50,803	25,080	19,550	[10]46,067	3,341	2.94	2.84	1.47	93.01	89.86	46.52
Racine, Wis.	.....	25.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Auburn, N. Y.	16,700	19.00	66,406	40,369	14,314	11,723	14,139	42,767	3.27	1.99	0.86	47.61	28.96	12.48
Macon, Ga.	.....	[42]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Joliet, Ill.	16,329	.....	58,044	36,994	12,500	8,550	[10]39,818	[15]11,693	1.42	1.78	0.86	42.33	53.01	25.68
Oklahoma City, Okla.	16,226	.....	71,201	51,926	15,000	4,275	[10]12,092	23,833	2.93	2.19	1.11	86.79	65.02	32.81
Oshkosh, Wis.	.....	[43]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Hoboken, N. J.	.....	5.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sacramento, Cal.	15,656	.....	101,656	39,805	41,303	20,548	[10]41,863	40,743	4.55	3.25	2.64	[23]	[23]	[23]
Pueblo, Col.	15,595	[44]	175,954	87,852	49,000	39,102	[10]84,860	37,640	6.85	5.64	3.93	[28]34.85	[28]34.91	[28]25.05
Everett, Mass.	15,510	.....	39,156	24,215	8,214	6,727	50,001	66,429	3.40	1.26	0.53	113.29	42.01	17.63
Taunton, Mass.	15,470	.....	80,550	32,407	27,001	21,142	[10]39,710	13,888	3.05	2.60	1.73	121.54	103.67	68.98
Newport, Ky.	15,334	.....	52,274	28,739	15,000	8,535	[10]6,181	22,694	2.44	1.70	0.94	96.11	67.02	37.02
La Crosse, Wis.	14,576	[24]5.00	38,411	19,164	12,197	7,050	[10]10,104	15,327	1.84	1.32	0.87	54.12	38.72	25.64
Fort Worth, Tex.	16,798	35.00	205,245	140,433	42,500	22,312	[10]144,225	[15]25,437	[25]	[25]	[25]	144.89	165.39	95.72

[22] Average not computed, because the system owned by city supplies only small part of municipality.
[23] Average not computed, because amount of water supplied to pipes was not reported.
[25] Per capita average not computed, because no reliable estimate of population could be made.
[28] Report on water supplied to pipes is for north side plant only.
[33] 150 hydrants at $70 and 125 at $80 each; 100 free and 60 private.
[34] For those hydrants not owned by city.
[35] 403 hydrants at $37.50 and 4 at $46.87 each.
[36] 200 hydrants at $45, 50 at $30 and 122 at $20 each.
[37] 154 hydrants at $40 each and 22 free.
[38] 269 hydrants at $60 and 3 at $30 each; 100 private hydrants owned by Union Stock Yards Co.
[39] City paid water company $7,000 for all water used by city; hydrant rental not reported separately.
[40] 214 hydrants at $50 and 100 at $40 each.
[41] 250 hydrants at $32.50 and 344 at $30 each. For 36 hydrants not owned by city rental was not reported.
[42] 200 hydrants at $40 and 46 at $37.50 each.
[43] 400 hydrants at $40 and 44 at $25 each.
[44] First 100 hydrants at $60 and balance at $48 each.

for group II, 48 cents for group III, and 50 cents for group IV. Under the head of "Expenses of Operation" are included, besides salaries and wages and other expenses, an estimated charge for depreciation equal to 2 per cent of the present value, and a tax calculated on the same present value at the rate of general property taxes for city purposes on the reported true value. The life of each system is thus assumed to be 50 years. There is also included in the "expenses of operation" annual interest on the present value of the system, this being computed for each city by use of the mean rate of interest paid on its debt for water supply.

MUNICIPAL WATER WORKS PLANTS

In Seventy-four Percent of All Cities of Over Thirty Thousand Population—Spacing of Fire Hydrants—Hydrant Rental—Finances of Departments

According to the latest Census Report (for the year 1907) of the 158 cities in the country having more than 30,000 population, all but 41 had municipal waterworks plants which furnished all or part of the public supply. Of the 15 cities having more than 300,000 population, San Francisco and New Orleans were the only ones without municipal supplies, and at New Orleans a municipal plant is now in operation. New York City and Pittsburg obtain a small part of the public water supply from private companies.

Among the 27 cities having between 100,000 and 300,000 population, all have municipal supplies except Jersey City, N. J.; Denver, Col.; Omaha, Neb.; New Haven, Conn.; Scranton, Pa.; St. Joseph, Mo., and Paterson, N. J. Indianapolis, Ind., obtains a part of its supply from a private company.

Of the 46 cities having between 50,000 and 100,000 population, 13 obtain their supply wholly from private companies and one has both a private and municipal supply.

Of the 67 cities having between 30,000 and 50,000 population, 23 are furnished with water by private companies and the remainder by municipal plants.

This shows 74 per cent of the cities of more than 30,000 population have municipal plants; which furnish all the supply in the majority of cases, a part—generally a small part—being furnished by private plants in four cities only.

Stated in percentages, in cities of more than 300,000 population 13 per cent are supplied entirely by private companies. In cities between 100,000 and 300,000, 24 per cent are supplied entirely by private companies. In cities of from 50,000 to 100,000 population 28 per cent are so supplied; and in cities between 30,000 and 50,000 population 34 1/3 per cent are supplied by private parties.

Comparing the total length of mains with the number of fire hydrants in each of the four districts, we find the number per mile to be 10 1/3 in the largest cities, 8.8 in the next size, 8 1/3 in the third group of cities and 7¾ in the fourth group. This is equivalent to an average distance between fire hydrants of 511 feet, 600 feet, 633 feet and 681 feet in the four groups of cities respectively.

Over one-half of the cities having municipal plants make no statement as to allowance for hydrant rental, but about one-third of them gave figures which probably represented either a payment to the department by the city or a credit which the department placed upon its books. These sums varied considerably, from a minimum of $3.00 to a maximum of $100. Five were less than $10, 16 less than $25, and 9 more than $50. The average of all of the rates was $36.80.

The expenses of operation as given in the table include an estimated charge for depreciation equal to 2 per cent of the present value, and a tax calculated on the same present value at the rate of general property taxes for city purposes. These expenses do not include interest, which is listed separately and was computed for each city on the basis of the present value of the system and the mean rate of interest paid on its debt for water supply.

The average expense of operation for the entire country per million gallons supplied to the pipes was $41.01, and the average interest was $24.08. Averaging by population groups, we find the cities of group I had an average expense of operation of $35.47 per million gallons and the interest $19.34. For group II, the average operation expenses and interest respectively were $54.62 and $38.18. For group III these were $54.56 and $33.18. For group IV, the averages were $49.84 and $30.58. In group I the average expense of operation ranged from a minimum of $16.22 to a maximum of $106.06, and the interest charges from a minimum of $7.41 to a maximum of $69.65. In cities of the second group the operation expenses varied from a minimum of $20.04 to a maximum of $92.56; and the interest charges from a minimum of $11.62 to a maximum of $81.83. In group III the operation expenses varied from a minimum of $24.42 to a maximum of $151.75; and the interest charges from a minimum of $11.89 to a maximum of $88.88. In group IV the operating expenses varied from a minimum of $17.72 to a maximum of $165.39; and the interest charges from a minimum of $10.09 to a maximum of $95.72. The above costs are for municipal plants only.

Of great interest are the figures showing the approximate profit or loss of municipal operation of waterworks plants. Including in the cost of operation the interest, we find that, averaging all the municipal plants, the cost exceeded the total earnings by $5,694,436; being about $3,000,000 in cities of the first group, $900,000 in cities of the second group, $1,250,000 in cities of the third group and $500,000 in cities of the fourth group. The only cities in which the total earnings exceeded the total costs were Chicago, Boston, Milwaukee, Jersey City, Louisville, Ky.; Providence, R. I.; Toledo, O.; Los Angeles, Cal.; Worcester, Mass.; Seattle, Wash.; Fall River, Mass.; Grand Rapids, Mich.; Albany, N. Y.; Trenton, N. J.; New Bedford, Mass.; Springfield, Mass.; Somerville, Mass.; Savannah, Ga.; Schenectady, N. Y.; Waterbury, Conn.; Houston, Tex.; Harrisburg, Pa.; Spokane, Wash.; Bayonne, N. J.; South Bend, Ind.; Pawtucket, R. I.; Binghamton, N. Y.; Sioux City, Ia.; Topeka, Kan.; Allentown, Pa.; Malden, Mass.; Springfield, Ill.; Chelsea, Mass.; Newton, Mass.; Kalamazoo, Mich.; Woonsocket, R. I.; Auburn, N. Y.; Everett, Mass.

The figures just given are extreme in their conservatism, and in many cases do not do full justice to the business management of the department. For instance, in the case of Reading, Pa., the interest on the value of the plant at 4 per cent is $122,437. As a matter of fact, after paying for maintenance, the interest on all the outstanding bonds ($400,000) and $51,500 into the sinking fund, $84,522 was spent in permanent improvements, $5,000 was given to the Park Department and $13,000 added to the balance account. Over $2,000,000 of bonds have been redeemed from the sinking fund in past years. Had this been kept in the fund, interest on such fund at 3 per cent would have shown a profit of $50,000 instead of a deficit of $10,000, which profit should be diminished by $9,700, the difference between the estimated depreciation and the amount paid into the sinking fund.

Neglecting the interest account the earnings exceeded the expenses of operation in all but two cities of the first group—Buffalo and Washington, D. C.; in all but one city of the second group, Indianapolis, Ind. In all but five cities of the third group, Lowell, Mass.; Troy, N. Y.; Yonkers, N. Y.; Salt Lake City and Erie, Pa.

The value of services *given* to the city by the water department by these 158 cities (less two which did not report) was estimated at $9,310,691, which is a little over 17 per cent of the total collections of the departments for services. Probably one cause for Washington's poor showing in the matter of profit is that the services given to the city are estimated to be over 50 per cent as great as those for which collections are made; in other words, over 1/3 of the water furnished is not paid for.

We find that all the cities have an outstanding debt for their waterworks except Washington, D. C.; Binghamton, N. Y.; Springfield, Ill., and Kalamazoo, Mich. Each of these plants was built by the city between 1854 and 1869. The outstanding debt averages a little over 40 per cent of the net cost of the system, being something under 40 for group I, nearly 60 for group II, and about 45 for groups III and IV. Several cities besides those mentioned as having no outstanding debt have reduced this to a very small amount, Indianapolis having but $10,000; Somerville, Mass., $69,000; Hoboken, N. J., $20,000; Sioux City, Ia., $42,000; Wheeling, W. Va., $23,600.

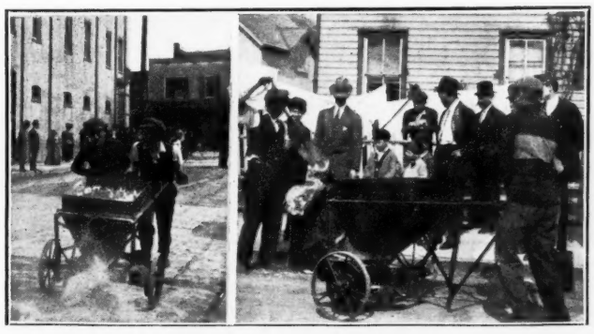
DRY CALCIUM CHLORIDE DUST LAYER

The use of calcium chloride, dissolved in the water of sprinkling carts, was described in the Municipal Journal and Engineer of March 3, 1909. This chemical, in its ordinary commercial form, is a solid mass and is handled in hermetically sealed drums. A granular form of the chemical was prepared and tried under the direction of the Roads Improvement Association of England from June to September, 1909. About the same time a series of experiments were conducted by manufacturers of the material in the vicinity of Syracuse, N. Y., some of them under the inspection of the New York State Highway Department.

Rather paradoxically, the application of granular calcium to a road is a process of making a water-bound macadam which does not dry so long as the chemical stays in it and there is any moisture in the atmosphere. Calcium chloride is a deliquescent salt—that is, it has the property of absorbing water from the air and retaining it in solution. A quantity of this chemical, if exposed in a dish, will absorb a definite quantity of water, varying with the humidity of the atmosphere. In a general way it may be said that a solution of calcium chloride and water having a gravity of about 20 Baume is in stable equilibrium so far as the absorption of water from the atmosphere under ordinary conditions is concerned. The chemical has long been used in the laboratory for drying purposes and quite extensively commercially in refrigerating plants. On account of its non-corrosive properties it is preferred to common salt in making the brine which is distributed through pipes in the refrigerating process. It is a by-product, but not a waste product, in the manufacture of soda ash from common salt. If calcium chloride were not produced the alternative product would be ammonium chloride.

The use of calcium chloride in the solid granular form was given a demonstration test on April 15 on Rockwell avenue, Long Branch, N. J. Rockwell avenue is a gravel street leading out of Broadway, the business street of Long Branch, and extending toward the beach. The traffic is that of an ordinary suburban street. The gravel is of the general character obtained along the New Jersey coast. The percentage of coarse stone is not as great as that in the gravel banks in many parts of the country, but it makes an excellent road and is an economical and satisfactory solution of the road problem in that locality, barring the dust nuisance; but on account of its fineness a greater than the average amount of dust is formed. The roadway of the street is about 26 feet wide and is curbed.

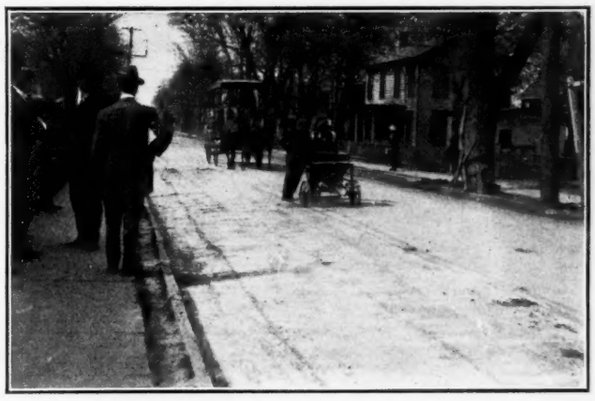
Before the test was made, drums of the calcium chloride had been distributed at intervals of about one hundred feet along



FRONT AND SIDE VIEW OF DISTRIBUTING CART

the curb. A handcart with distributing device scattered the chloride. This consists of a hopper of sheet metal of three or four cubic feet capacity. Across the top of this is an iron grating which catches any lumps of chemical which may be found, and which may be broken up with the back of a shovel. The bottom of the hopper is open except for the discharge chute, which closes it sufficiently to hold the material. When the cart is in motion this chute distributes the chloride quite uniformly for a width of about five feet by means of a rapid side motion given it by a cam operated through a series of gears and shafts from the hub of the wheel. The discharge chute is similar in operation to the feeding device of an ordinary burr mill.

Two men are necessary to push the cart, as it is all made of iron and considerable power is used in mechanical work. In this particular instance the cart was a new one just from the shop and consequently stiff. The men, however, pushed the



ROAD PARTLY COVERED WITH CALCIUM CHLORIDE

cart along the street at an ordinary walk, beginning close to the curb and proceeding in a straight line the length of the block, 350 feet. In this way one block of about 1,000 square yards was covered in an hour. Whether the men could keep up the pace all day might be doubted. They were light men, however, and only heavy men should be used, as most contractors know, for pushcart and wheelbarrow work. In the experiments about Syracuse a different method was employed. The drums of calcium chloride were put on a wagon ahead of the distributing cart and the chemical shoveled into the hopper. This saved the time lost at Long Branch in filling the cart from the drums along the curb. In this way one team and two men covered two miles of State highway a day. The chloride is used in sufficient quantity to give the street a white appearance; to a person standing at a distance it looked as white as a street after a heavy snowfall of say five minutes. The close observer can see that the process of absorbing moisture begins at once. Small particles accidentally scattered on the flag sidewalk attract moisture and show like drops of water. In ten to fifteen minutes the general appearance of the street changes; the larger particles still are visible, but the pulverized chemical has disappeared and the ground has a dark appearance, indicating moisture.

As to the quantity of material required, while any amount can be used that is thought desirable, one pound per square yard for the first application and one-half pound per square yard for succeeding applications is considered sufficient. It is estimated that four applications will be ample for a period of eight months. The amounts necessary would vary, however, with the climate, season and condition and nature of the roadway. In the Long Branch demonstration, owing to green men, new machinery and consequent lack of uniformity in distribution, more than this quantity was used. Four drums containing 375 pounds each were spread over a thousand square yards. The ordinary price charged for this material by the Solvay Process Company, which is marketing it, is $13 a ton; making the cost of chemical 1,500 pounds times $.0065 per pound equals $9.75. Two hours labor at 20 cts. an hour, and trucking of four barrels, estimated at 5 cents each, makes the total cost $10.35 per thousand square yards. The demonstration was given under the direction of Reginald K. Pierce, who has charge of this branch of the Solvay Process Company's business, and of E. B. Houghton, the company's New Jersey agent. Mayor Charles O. McFaddin, of Long Branch, was present during the test.

NEWS OF THE MUNICIPALITIES

Current Subjects of General Interest, Under Consideration by City Councils and Department Heads—Streets, Water Works, Lighting and Sanitary Matters—Police and Fire Items—Government and Finance

ROADS AND PAVEMENTS

Guarding $600,000 Paving Loan

Chester, Pa.—The committee recently appointed by the Board of Trade to act as guardians of the taxpayers in the expenditure of the $600,000 to be borrowed by Councils under the loan bill is getting ready. It is composed of former State Treasurer William H. Berry, John J. Buckley, Frederick A. Howard, Daniel G. Henricks, John J. Ryan, James M. Hamilton and Frederick Selby. It will communicate with officials of cities all over the country for data as to the character of paving material used, prices, etc., and when the bids are awarded by Councils the committee will protest if the work is given out at too high a figure.

Referendum Over Street Width

Chicago, Ill.—A postal-card referendum, in which every property owner on Wabash avenue between East Thirty-ninth street and East Garfield Boulevard will have a vote in proportion to his frontage on the relative merits of a 34-foot or a 50-foot roadway, was decided on by the Board of Local Improvements. The Board started out with the plan of reducing the roadway from 50 to 34 feet when the new asphalt pavement is laid, but at a public hearing, on account of protests, receded from that plan and will take the referendum to determine which width the majority prefers. "Saving in cost of paving, the increased beauty of the street, absence of unused dirty street, subsequent cheapening of cleaning and sprinkling and many other things should, in my opinion, recommend the narrow roadway to the property owners on Wabash avenue," declared Albert F. Keeney, President of the Board. Other members of the Board substantiated his opinion and produced a bulky bundle of letters from property owners on the street opposing those who want to retain the 50-foot roadway.

May Invoke the Sherman Anti-Trust Law

Enid, Okla.—The City Commissioners have issued an invitation to city attorneys, city engineers, mayors and paving committees of the cities throughout the State to meet for a conference. As the call was issued shortly after the second rejection of some bids for sheet asphalt paving, and because no action has been taken in paving matters since then, it is supposed that ways and means for dealing with the alleged asphalt paving monopoly will be the subject of the conference. That the meeting will determine upon an action to prosecute the companies concerned for a violation of the Sherman Anti-Trust Law is the opinion of some. The circumstances leading up to the new action are as follows: Some time ago the Commissioners at a meeting ordered some 30,000 yards of paving laid, and authorized the City Clerk to advertise for bids for the same. When the bids were opened it was found that the Warner-Quinlan Company was one of the bidders. It proposed to do the work for $2.07 per square yard. The Cleveland Trinidad Paving Company offered to do the work for $2.08 per square yard. The Commissioners rejected the bids and instructed the Clerk to readvertise. The second time the Warner-Quinlan Company was the only bidder, and offered to do the work for $2.04 per square yard. Again the Commissioners turned the offer down.

Highway Commissioner Writes to Contractors

Hartford, Conn.—James H. MacDonald, State Highway Commissioner, addressed a letter to contractors authorizing them to start work at once. They are enjoined, however, not to lay any stone on the roads until the weather is definitely and permanently settled, so that first-class construction will result.

Lawrence Has Steep Grades

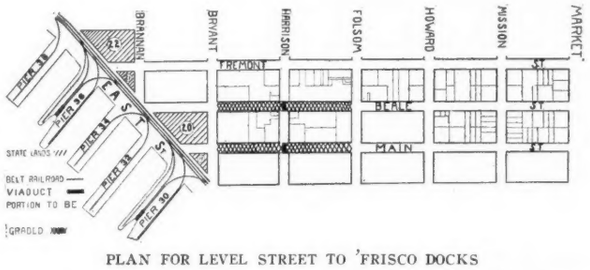
Lawrence, Mass.—An enterprising citizen and autoist of statistical learning has tabulated the streets having steeper grades than 10 per cent. He found 18 in this class. The steepest grade was on Floral street, 20.68 for a distance of 118 feet.

Asks Authority to Change Grades of Railroads

New York, N. Y.—The Public Service Commission is preparing a bill for presentation to the Legislature, the passage of which, it declares, is the only means which will prevent the city's being mulcted in heavy damages to property owners by reason of the changes of grades in the streets in connection with the present negotiations for the elimination of dangerous grade crossings. The bill will authorize the Commission in its negotiations to order a change of grade of any existing railroad as well as the grade of any existing street. Under the present railroad law the Commission has the power to decree that a street or highway shall be raised or lowered when a grade crossing is eliminated, but it has no right to say that the grade of the railroad shall be altered so as to make it pass under or over the thoroughfare. The result is that the city is called upon to pay damages to the owners of property injured by the raising or lowering of the street, whereas in many cases such damages could be avoided by raising or lowering the grade of the railroad. In consequence of such conditions it is next to impossible for the city authorities to establish grades for such streets as now are crossed by steam railroads. This, in turn, works a hardship upon owners of property who desire to build. They cannot get from the authorities the future grade line of the street, and as a result they erect their buildings upon the present grade line, which is apt to be changed when the neighboring grade crossing is eliminated.

To Regrade Streets Leading to Dock

San Francisco, Cal.—Following up the improvement of Beale street, the Merchants' Association has asked for the cutting down of the grade of Main street, in order to provide another level thoroughfare from the vicinity of the new docks to the business center of the city. The proposed change of grade would be made between Folsom and



PLAN FOR LEVEL STREET TO 'FRISCO DOCKS

Bryant streets, and the association asks that Harrison street be carried over by a viaduct 35 feet wide, as at Beale street. The contemplated lowering of Harrison street is not suggested as part of the present proposal, inasmuch as it is of little benefit to property in the neighboring blocks on Beale and Main streets and does not seem to be desired by owners of the Harrison street frontage. It may be taken up as a separate proposition, after the grades of Beale and Main streets are lowered. In the meantime, Harrison street would furnish an easy route to the top of Rincon Hill.

Bridge Successfully Moved

Pittsburg, Pa.—The South Twenty-second street bridge has been raised 17 inches and shifted downstream 11 inches. Herman Lant, bridge engineer, working in conjunction with the Bureau of Construction of the Department of Public Works, and the Dravo Contracting Company worked out the details for moving the 2,000 tons of steel. Two temporary piers were constructed on each side of the old piers, resting on temporary piling. From the tops of these two piers a big steel truss was constructed. The truss was placed in position to raise the two spans of the bridge. Hundreds of jackscrews were applied and the bridge lifted and pushed over into its new position. The old piers, which are giving way, will be torn down and rebuilt.

SEWERAGE AND SANITATION

Metropolitan Water and Sewerage District for New York

Albany, N. Y.—Assemblyman Lindon Bates, Jr., of Manhattan, introduced a bill establishing a metropolitan water and sewerage district, comprising New York City and the adjacent counties. The measure calls for a unified system of water supply, prevention of stream pollution and sewage disposal. State responsibility for and control of water supply advocated by Mayor Gaynor is provided for by the establishment of a metropolitan water and sewerage board of five members, on the lines of the Boston Metropolitan District Board and the London Water District Board. The recommendations of the Sewerage Commission appointed by Mayor McClellan to report on the pollution of New York Bay regarding interstate agreement and unified management for the disposal of sewage are followed out. The President of the Board is to be named by the Governor and will receive $15,000 a year. Two other members with salaries of $10,000 are to be appointed by the Governor and two by the Mayor of New York. After the precedent of the London Water Board, the boards of supervisors and the Mayors of cities in rural counties within the metropolitan district may be represented in the Board by associate members, serving without salary, but having the right of access to all papers and the right to attend all meetings. The Metropolitan Water Board is given the duty of providing to all cities and towns in the southern counties an ample supply of water and of arranging the sanitary disposition of their sewage in exchange. The restrictive laws of Westchester, Putnam and Dutchess Counties are repealed, so that the Board may have a free hand to make a unified system. On January 1, 1911, the Board of Water Supply and the Aqueduct Commission are to be abolished.

Defects of Binghamton's Sewerage System

Binghamton, N. Y.—Professor H. N. Ogden, of the State Department of Health, has submitted a report of his investigations of sewerage conditions at Binghamton, in which he summarizes the situation by declaring that a general system plan of constructing sewers should be outlined. Some sewers he found were much too large and some are overtaxed and flooded by every heavy rain. The low water flow of the rivers is not sufficient to properly dilute the present sewage flow, characteristic change odors along the Chenango, arising from the large proportion of sewage in the river, being plainly detected. As it is evident that sewage disposal will be ultimately required, it is important that new sewers be built with a view of separating house drainage and storm water.

City May Require Sanitary Fountain

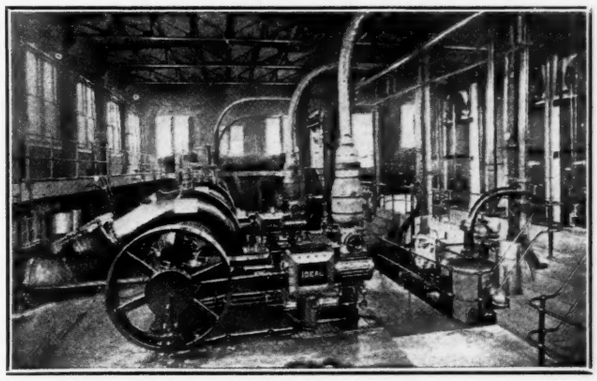
McKeesport, Pa.—Just what kind of drinking fountain the W. C. T. U. will be permitted to place near the B. & O. station in Fifth avenue has not yet been decided by the Board of Health. The principal objection to the ordinary drinking fountain is the public cup. The department may insist upon a strictly sanitary fountain, with an arrangement to furnish sanitary cups. It is said the city can get these at a reasonable cost. The matter has been referred to the Sanitary Committee of the Board, which is composed of Drs. H. S. Vankirk and W. H. Chambers. They will examine the kind of fountain it is proposed to place, and make a recommendation to the City Engineer. The city is to supply water and ice without charge.

Will Take Permanent Measures to Prevent Pollution

Syracuse, N. Y.—As the result of a conference held between Mayor Edward Schoeneck and representatives of the Academy of Medicine and Chamber of Commerce, it is understood that the Mayor will name a permanent commission to safeguard the watershed of Skaneateles Lake. This commission will carry on a careful and systematic campaign to make certain the protection of Syracuse's water supply. It is planned to arrange for such protection along systematic and permanent lines. The commission will consist of the Superintendent of the Bureau of Water, one representative of the Academy of Medicine, one of the Health Committee of the Chamber of Commerce and one of the State Department of Health. To this number will be added a fifth person to be designated by the Mayor.

Sacramento Sewage Pumping Station

Sacramento, Cal.—The accompanying illustration is a view of the interior of the city sewerage pumping station, located at Front and U streets. The plant was designed by City Engineer George N. Randle, and has been built under his personal supervision. The building is a substantial structure of reinforced concrete. Four steam-driven pumps have been installed with a total capacity of 72,000,000 gallons in



Courtesy Sacramento Bee

SACRAMENTO SEWAGE PUMPING STATION

twenty-four hours. Two of the pumps have a capacity of 24,000,000 gallons each, and the other two have a capacity of 12,000,000 each. The city officials do not believe 72,000,000 gallons in twenty-four hours is sufficient, and recently contracted for the installation of an additional 24,000,000-gallon pump at a cost of $19,000. With the additional unit it is believed the capacity will be sufficient to keep the city drained of all storm water, even after the severest rains. In addition to the big expenditure at the pumping station, within the past two years, the city has expended about $200,000 in laying new main line and lateral sewers, and at present sewers reach nearly every part of the city.

Water Works and Sewerage System Finished

Hereford, Tex.—John B. Hawley, of Fort Worth, who has been putting in the water works and sewerage systems for Hereford, has finished his work, and the city has accepted it.

Doctors for Health Bureaus

Annapolis, Md.—Drs. William H. Welch, Howard Bratten and N. R. Gorter, of the State Board of Health; Dr. Marshall L. Price, secretary of the Board; Health Commissioner Bosley, of Baltimore, and Water Engineer Quick called on Governor Crothers and urged him to sign the bill appropriating $20,000 for the establishment of five bureaus in connection with the work of the State Board. One of the principal bureaus will be that headed by a sanitary engineer, who will have supervision over the various watersheds of the State to prevent the water from becoming polluted. The doctors and Mr. Quick said that the establishment of the bureaus would mean the saving of hundreds of lives every year and would also prevent much sickness. The Governor was much impressed with the arguments of the doctors and Mr. Quick, and it is believed that he will sign the bill. Through its adoption Dr. Welch said that Maryland would have one of the best State Boards of Health in the country.

For Better Sanitation in Market District

Washington, D. C.—There will be a great deal to do in the market stands owned by the merchants in the wholesale and produce market districts along Louisiana avenue and the streets in the section known as "the line" when the police and health inspectors get through with a crusade started quietly some time ago. That whole section, given over to the handlers of live stock, meat, vegetables and food of all sorts, has been under the scrutiny of men from the District Building. Conditions, sanitary and insanitary, have been noted, photographs of actual conditions have been made, and the whole batch of evidence is now in the hands of a committee of three District officials, to be studied and used for the basis of regulations which will correct some of the conditions which the Commissioners think are bad, to say the least.

WATER SUPPLY

Four Years to Build Water Works

Baltimore, Md.—Water Engineer Quick says that about four years will be required to complete the $5,000,000 water reservoir and filter system. From four to six months will be required to draw the plans and the first contract may be let toward the end of the summer. The top floor of the Knickerbocker Building has been secured by the city, and the Gunpowder supply improvement division of the Water Department will have quarters there. The filtration plant is to be directly north of Lake Montebello, in the city, while the dam will be 2,200 feet north of the present dock at Lock Raven. About forty acres will be required for the filtration plant, and from 2,500 to 3,000 acres for the reservoir.

Taxing Water Mains of Another Town

Bristol, Conn.—The towns of Bristol, Plainville, Burlington and Southington will jointly defend the actions of their Board of Assessors in taxing property of the Water Department of the city of New Britain. A conference of the Selectmen of these towns was held in the office of Judge Epaphroditus Peck and he was retained as counsel to represent those towns. New Britain has taken an appeal to the courts. The question of taxation that has been raised is a puzzling as well as important one, and will undoubtedly go to the State's highest court.

Two Water Systems; City Wants Neither

Columbus, Ga.—Columbus' water situation is quite unique in its present status, and just what will be the outcome of the unusual tangle that now exists is difficult to predict. The private water company is in the hands of a receiver and is operating under orders from Judge Newman, Mayor W. S. Greene being the receiver. The city of Columbus has voted to issue bonds to build municipal water works, and has fought out in the courts the injunction proceedings brought by the bondholders of the private water company seeking to prevent the municipality from taking such a step. Judge Newman has refused to grant the injunction prayed for by the bondholders, but has coupled with this the condition that in case the city operates its own water works it buy the old system at the appraisement fixed upon it by the Master in Chancery. This appraisement is considered too high by the city, and it has taken an appeal from Judge Newman's ruling to the Supreme Court of the United States, where the case is now pending. At present if the city should attempt to operate a water works system without buying the mains and other property of the Columbus Water Works Company it would be in contempt of court. In the meantime, the city contracted for the boring of a group of artesian wells a mile or so south of the city limits. The wells were completed recently and the official test has begun. A flow equivalent to over 4,000,000 gallons a day was produced, but the contractors found their power equipment unable to bring the flow up to the required amount, so the official test was abandoned and the company is now making private tests of its own. The official test has not been made in the time limit named in the contract and this brings about complications. In the meantime, the water works bonds authorized by the voters several years ago are gradually expiring by limitation, the issue having been automatically reduced already from $250,000 to $200,000.

City Advises Consumers About Water Company Rates

Independence, Kan.—Owing to a controversy of long standing between the Independence city government and the Independence Water Works Company, the City Council has decided to issue a pamphlet telling the people just what their rights are with reference to water service. The company demands payment for the use of meters, and threatens to take them out if payment be refused. The city will advise consumers to tender payment for the water used, but to refuse payment for the use of meters. Allen C. Southern, City Counselor, has advised that customers have three options: to buy meters of their own and have them installed at their own expense; to request the company to put them on a flat rate, or to agree voluntarily with the company to pay the amount of meter rental demanded. He says the company has no right to shut off the water service for any other cause except non-payment for water consumed.

Town Ownership Pays Lewes Well

Lewes, Del.—The report of the Board of Public Works of Lewes shows a remarkable saving to the town since it has owned its own water and electric lighting plant, and furnishes an excellent argument to the advocates of municipal ownership, in which every citizen of Lewes is a firm believer. The plant has turned over to the town $17,000 for the year's work and saves it $2,300 for lighting and water paid in other years, forming a net profit upon the experiment of $4,000.

Water Becomes Discolored in Pipes

Norfolk, Va.—Complaint has been made of the bad color in the city water as drawn at house faucets. City Engineer Dornin, Controller Purdie, chairman of the Water Committee of the Board of Control, and other officials made a visit to lakes and pumping stations in search of the cause of the trouble. The water was found to be perfectly clear at both places. The inference seems to be that the mains need cleaning, and this will probably be done.

Mayor to Suggest Lower Water Rates

Louisville, Ky.—Reduction of the water taxes from 10 to 15 per cent was advised by Mayor W. O. Head at a meeting of the Water Board, and the motion was carried. Now that the plant of the water company is in perfect condition and the company is profiting by at least $100,000 a year, Mayor Head believes it advisable that the rates be cut rather than to accumulate a surplus with which to pay off the bona fide indebtedness, which runs for a number of years at a favorable rate of interest. The new rates, which will provide sufficient funds each year in excess of all expenses to permit the establishment of a surplus fund with which to meet the bonds when payment is due, will go into effect July 1, as the bills for this quarter will have already been paid.

Louisville Water Is Pure

Louisville, Ky.—The City Chemist, Dr. Vernon Robins, has submitted the following report of the condition of Louisville water:

Samples of water were obtained from the Highlands, South Louisville, Parkland, and from a spigot in the chemical laboratory:

Highlands.—Appearance, very clear. Parts per million: Free ammonia, .03; albuminoid ammonia, .045; chlorine, 9; nitrogen as nitrites, slight trace; nitrates, .05; required oxygen, 1.25; alum (Hæmatoxylin method), none.

South Louisville.—Appearance, very clear. Parts per million: Free ammonia, .045; albuminoid ammonia, .095; chlorine, 8; nitrogen as nitrites, slight trace; nitrates, .0603; required oxygen, .96; alum (Hæmatoxylin method), none.

Parkland.—Appearance, very clear. Parts per million: Free ammonia, .05; albuminoid ammonia, .075; chlorine, 12; nitrogen as nitrites, slight trace; nitrates, .055; required oxygen, 1.45; alum (Hæmatoxylin method), none.

Laboratory.—Appearance, very clear. Parts per million: Free ammonia, .025; albuminoid ammonia, .04; chlorine, 10; nitrogen as nitrites, slight trace; nitrates, .07; required oxygen, .65; alum (Hæmatoxylin method), none.

One cubic centimeter of the water from the Highlands planted in litmus lactose agar and grown at 37 degrees Centigrade for two days shows three colonies. One-half cubic centimeter of the same water treated in the same way shows no colonies.

The same treatment for the South Louisville water yields for one cubic centimeter no colonies; for one-half cubic centimeter, no colonies.

The same treatment for the Parkland water yields for one cubic centimeter three colonies, and one-half cubic centimeter, one colony.

The same treatment for the laboratory water for one cubic centimeter shows nine colonies and one mold; for one-half cubic centimeter yields five colonies.

On adding one cubic centimeter and ten cubic centimeters of each water to respective fermentation tubes of glucose bouillon and grown 37 degrees C. for two days shows no gas development in any case.

Results: No alum is found present. The water does not contain any disease-producing germs, those found being harmless water bacteria. Alum has been frequently tested for in the Louisville Water Company's water, and has never been found.

Since the operation of the new plant, the character of water furnished the city of Louisville is of most excellent quality and the contrast wtih the raw Ohio River water furnished assures us that the city of Louisville is getting as pure a water supply as any other city in the United States.

Company Offers Artesian Water to Trenton

Trenton, N. J.—The stockholders of White City, who own a tract of land containing an amusement park, have made a proposition to furnish the city with artesian water which, from recent investigations, is believed to exist in large quantities under the park. The Water Board is asked to delay its decision regarding a new supply until

POSSIBLE WATER SUPPLY FOR TRENTON, N. J.

more wells have been sunk in the White City property and more accurate tests made to determine the quantity of water that could be developed. If these tests confirm the surface indications the company offers to sell water to the city for a term of twenty years. At the end of that period the company will turn over the plant which it installs, including a pumping station, to the city free of charge. Charles J. Fury, receiver of the company, was given a preliminary hearing before the Water Committee last week, during which he told of the plans of the company.

Diversion of Water from State Prohibited

Trenton, N. J.—An act which will probably prevent any water company from diverting the subterranean potable waters of New Jersey to other States, with the possible exception of the Hudson Water Company's diversion to Staten Island, was passed by the Senate, when favorable action was taken on McCran's bill. This bill will make it unlawful to lay pipes in any lands of the State under tidal waters without the permission of the Governor and Riparian Commissioners obtained in writing. There was not a vote against the measure.

Water Company Refuses Water to Extinguish Fire

Chester, W. Va.—At the mercy of the Southside Water Company, which held back all supply from its pumps because a faction of citizens that has been fighting the city government had got out an injunction against it, the Fire Department was forced to stand by helplessly for several hours last week and watch a fire which started in one of the largest livery stables of the town at will before a stiff breeze that swept it rapidly into the business district. Finally, the frantic citizens made a charge on the water plant and compelled the employees to turn the water into the pipes, but by that time the flames had consumed nearly $125,000 worth of property, consisting of the stable, the five-story brick building of the Chester Hardware Company, two bakeries, one clothing store and nine residences.

People's Water Company Submits Report

Oakland, Cal.—An inventory of the People's Water Company's holdings, without any estimate, however, as to their value, has been submitted to the City Council. The report was made at the Council's request, in order to furnish a basis for fixing water rates. The production of water per day from water rights and watersheds owned by the company is given as 15,000,000 gallons, of which 7,000,000 is from the Alvarado plant and 8,000,000 from San Leandro and Grass Valley Creeks. The storage capacity of reservoirs is 5,250,000,000 gallons. The schedule of land gives an area, including reservoir, of 39,210 acres. The total length of pipes is 492 miles, varying in size from ¾ inch to 37½ inches. A total of 12,150 water meters have been installed, 320 fire hydrants, at the expense of the company, 1,200 services at the expense of the company and 50 cart hydrants at the expense of the company.

STREET LIGHTING AND POWER

Beaver Falls Wants Better Lighting Rates

Beaver Falls, Pa.—The Beaver County Light Company has secured a monopoly on the electric light business of Beaver County. The new owners of the lighting business in the Beaver Valley have stated that the service will be greatly improved and the rates reduced. At present the maximum rate is 20 cents per kilowatt. This will be reduced to about 11 cents. Citizens, however, are not inclined to be satisfied with this, and the erection of a municipal electric light service is being strongly advocated. According to the present status of the case the new corporation, styled the Beaver County Light Company, owns the poles, wiring and equipment in the borough, which are now on the streets without any right ,and the equipment will have to be removed. It is understood that efforts are being made for a special councilmanic session at which the Councilmen and officials of the new light company will confer in an effort to reach some satisfactory settlement of the matter.

Good Light on Every Corner

Decatur, Ill.—City Engineer A. B. Alexander advocates placing a street lamp at every corner and says that it would be the best advertisement the city ever had.

New Street Light Plan

Indianapolis, Ind.—Within a few weeks the new street lighting plant will be in operation on Washington street, from East to West street. The Merchants' Heat and Light Company now has gangs of men busy installing the new poles on those sections of the street which have not been equipped, and within the month Indianapolis is promised one of the best and most modern street lighting systems in the country. On Washington street, between East and West streets, there will be 125 of these special poles, bearing 625 lamps, 80 candlepower each. This is promised to give Indianapolis so brilliantly lighted a street that visitors will carry away the recollection of it as one of the sights of Indianapolis. At present the company has in operation lights on Washington street, from Meridian street to Capitol avenue, and from New Jersey to East street. Men are installing the poles from Capitol avenue to Senate avenue, and from Senate to Missouri street, and as quickly as that is done poles will have been obtained for the final block from Missouri to West street. This week work begins on the section running east from Meridian street to New Jersey street, which, when done, will give an entire mile of special lighting. In addition to the lighting of Washington street, the company has also been busy on other streets, and has already installed poles on the west side of Meridian street, from Washington street to the Union Station, thereby transforming this street, which has been dark and forsaken at night. The poles are already being installed on the east side of this street also. Some delay has been caused to the Merchants' Heat and Light Company by the inability to obtain uniform poles as fast as the business men of the several sections demanded the new lights. A different style of pole might have been obtained sooner, but it has been the determination to have the entire lighting system uniform. The general uniformity of the style of lights used has been the feature which has added beauty to the systems installed in a number of other cities.

Agreement Between Light Company and City

Quincy, Ill.—Mayor Steinbach, Corporation Counsel Pope and the Ordinance Committee of Council have reached an agreement with the Quincy Gas, Electric & Heating Company, through J. T. Lynn, the managing director; Manager Harry Cameron and his assistant, M. M. Hess, to grant a 30-year franchise to the company, in return for which the company will grant:

One per cent of the gross earnings, which now amount to about $180,000 per annum, for the first five years; 1½ per cent for the next five years and 2 per cent thereafter during the life of the grant. The right to purchase the plant after fifteen years, the price to be paid to be fixed by appraisers as was done in the case of the water works. The privilege of readjusting rates to be charged current users, every ten years. To place all overhead wires underground and remove all poles in the business section inside of two years, the underground conduits to be put in ahead of any street improvement work the city might undertake in the meantime.

FIRE AND POLICE

Needless Automobile Noises Hushed

Baltimore, Md.—Police are enforcing the clause of the new State law which prohibits the production of needlessly loud or shrill signals made by automobilists. When within the city limits only the rubber bulb horn or small electric bells of moderate sound may be used.

Steamship Lines Furnish, Lumber Firms Support, Fireboat

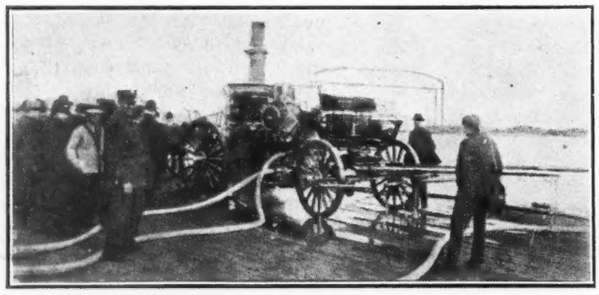
Los Angeles, Cal.—Metropolitan Los Angeles is now to have a fireboat to protect the shipping and other immensely valuable property at Los Angeles Harbor. The Fire Commission received an offer from the San Pedro steamship companies to place at the city's disposal free of charge a fast and powerful tugboat, providing the big lumber companies maintaining yards there will pay the expenses of the crew. The commission will enter into negotiations with the lumber companies at once.

Auto Chemical Engine Overturns

Muskogee, Okla.—One fireman was killed, one dangerously and one slightly injured by the overturning of an auto chemical engine when responding to an alarm. The machine was going at high speed, and was about to turn a corner when a buggy appeared in sight on the side street. Turning too suddenly to avoid this, the engine was upset and two of the men were caught under the machine.

New Engine Named After Late Chief

Duluth, Minn.—City officials of Duluth and Superior witnessed the test of Duluth's newest Nott fire engine at the foot of Fifth avenue west. The new engine, which has been named "John T. Black," in memory of the late Chief of the department, came above the specifications. Drawing water from the river under its own power, it threw 920 gallons a minute as against 956 gallons required. The engine can throw four streams about 120 feet in the air. Working with one nozzle it throws a two-inch stream about 200 feet. The new engine has been installed at West Duluth. No. 8 hall



Courtesy Duluth Herald

TESTING NOTT FIRE ENGINE

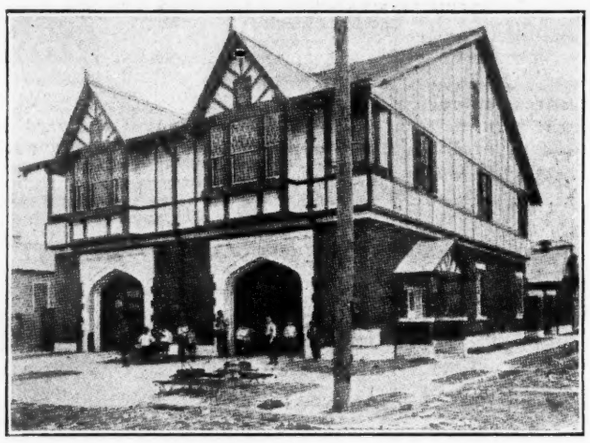
will house two companies instead of one, as at present, it being the intention to create a new company of the crew manning the engine. The Mayors and Fire Commissioners of the two cities at the head of the lakes were well pleased at the performance of the new engine.

Auto Engine Makes Good Record

Macon, Ga.—The new auto fire engine was tested in competition with a steam fire engine. Both machines had to run about 4,000 feet. The auto engine showed water in two minutes and forty-two seconds after the alarm was sounded. The horse-drawn steam engine showed water in six minutes and twenty-eight seconds.

Efficiency of Ocala Fire Department Tested

Ocala, Fla.—To test the efficiency of the Fire Department, Chief Chambers sent in two calls at night, one from box 95 and one from box 96. Although the men at the station were unaware of the test, record runs were made on both trips. The first call, a distance of three and a half blocks, was made in eighty seconds. Only one minute elapsed on the second call from the time the alarm was sent in until the wagons had arrived and were ready with the hose, a distance of three blocks. There was considerable traffic on the streets at the time of the test, and a large crowd was attracted both times. Chief Chambers has modernized the local department and has built it up to a high standard of efficiency.



AN ATTRACTIVE FIRE HOUSE

Model Fire Engine House Opened

New Orleans, La.—The dedication of the new engine house at Hagan avenue and Baudin street took place at 4 o'clock yesterday afternoon. It was done by the Frank T. Howard Improvement Association, which originated the plan for an engine house in that fast growing section. Mayor Behrman, Councilman Frawley, of the Third Ward; President Meister and Messrs. Sullivan, Junker, Eike and Peterson, of the Fire Board, and Assistant City Attorney John P. Sullivan represented the administration. The engine house is a very handsome one. It looks like a Swiss house, and is made of rough brick, cement and tiles outside and inside tiles and yellow pine and other material make it fine. From the outside it doesn't look like an engine house, and everybody said it was pretty enough to put alongside the library on St. Charles avenue. The Mayor said it was the handsomest engine house in the city, and everybody in the Third Ward is sure it is. The house cost $15,600 and the land $2,800. Upstairs the men have an elegant tiled bathroom with bathtub of the most modern style and shower bath, etc., just as good as in any hotel.

Test of Speedometers

Washington, D. C.—The monthly inspection of speedometers on the bicycles of the wheel squad of the Metropolitan police force, which was held on Sixteenth street near Columbia Road, showed only eleven of the speed testers to be inaccurate. Fifty members of the squad, with their wheels, assembled on Sixteenth street and took turns riding over a measured course at various speeds. The eleven machines which did not register accurately were returned to the factory for adjustment, while new ones replaced them.

Webb Company Will Make Auto Truck

Wilmington, Del.—President A. C. Webb, of the Webb Motor Fire Apparatus Company, of Vincennes, Ind., manufacturers of the Reliance automobile engine, and C. D. Stewart, a supervisor for the company, have had a consultation with the officers of the Delaware Fire Company, Wilmington, Del., to explain the details of an automobile fire truck the company is now building, and which is expected to be completed within six to seven weeks. It will then be taken on the road for demonstrating at the Fire Chiefs' convention, which will be held this summer at Syracuse, N. Y. The truck will be 24 feet from axle to axle, will weigh 100,000 pounds, whereas the present truck is the same length and weighs 90,000 pounds. The new truck will stand 6 feet 2 inches from the ground and will be equipped with a 75-foot extension ladder. The truck will be operated by electricity generated by gasoline, and the wheels, while solid, will have individual motors which will permit them to work separately; thus in case of accidents occurring to one or two wheels the remaining one will have sufficient power to propel it. Mr. Webb stated that the machine would make 25 miles an hour, possibly 27 miles, but he would not guarantee the latter figures. Should the truck prove satisfactory the Delaware Company will consider the purchase of one.

GOVERNMENT AND FINANCE

Commission Government

Aransas Pass, Tex.—This city adopted the commission form of government and elected W. H. Verner, Mayor; J. D. Powers and W. F. Stegall, Commissioners.

Cuero, Tex.—By vote of 210 to 112 commission government was defeated here.

Harlingen, Tex.—An election to incorporate the town under the commission form of government carried by a nice majority. J. B. McFarland was elected Mayor, and H. E. Morrow and John D. Hill, Commissioners.

Mayor Favors Salaries for Aldermen

Auburn, N. Y.—Mayor O'Neill sent a communication to a special meeting of the Board of Aldermen recommending a salary for the Aldermen, and upon motion of Alderman Losley the matter was, by unanimous vote, referred to the Board of Estimate and Control to establish a salary that would fairly compensate them for the services rendered.

Baltimore Charter Bill Defeated

Baltimore, Md.—During the last sessions of the Legislature, the Baltimore charter bill, the product of more than a year's work by the Baltimore Charter Commission, was defeated.

Physical Test for Laborers

Boston, Mass.—The chairman of the Civil Service Commission has notified Mayor Fitzgerald that it is no longer the practice of the Commission to register laborers according to the number of dependents on each applicant. Laborers are now registered according to the time of filing applications. The Commission also announced that it is planning a physical test for applicants.

Want Bids on All Contracts of Any Size

Chicopee, Mass.—Several of the Board of Aldermen have started a movement to compel the city to ask for bids on all contracts of any size. Particular reference has been made to the contracts for laying sidewalks and other such work, no single contract of which amounts to a great deal, but the aggregate of which totals a respectable sum each year. The idea is that the work could be done cheaper and that it would be giving all the contractors of the city a fairer show.

Welcomes Advice of Citizens

Boston, Mass.—Co-operation of citizens in its work of passing upon the appointments of the Mayor is welcomed by the Civil Service Commission, which issued a statement to this effect as follows: "In order that the Civil Service Commission may fulfill in the most complete manner possible the duty imposed upon it in making 'the careful inquiry' required into the qualifications of nominees for the positions of heads of departments, and in order that no injustice may be done to any nominee, or to the Mayor of the city of Boston, or to the public, by reason of the failure on the part of the Commission to receive the fullest information, the Commission hereby issues this formal notice that information as to the qualifications of a nominee presented to the Commission at its office in the State House by any one, in person, or in writing over his signature, will be considered in the investigation which the Commission will undertake under the rules framed by it and approved by the Governor and Council."

New Name and New Charter

Fishkill Landing, N. Y.—The towns of Fishkill Landing and Matteawan have petitioned the Legislature to be enabled to unite as a city under the name Melzinger, and also to adopt a commission form of government.

Mayor Gave Away 5,000 Soap Cakes; Was Re-elected

Kenosha, Wis.—M. J. Scholey, Mayor of this city, introduced a new feature into Kenosha politics recently when he distributed 5,000 bars of toilet soap as a means of calling attention to his candidacy for re-election. The soap is ordinary toilet size, and on one side of the white bar in raised letters is "Purity Soap," while on the reverse is a picture of the Mayor and the inscription, "A Clean Administration." The Mayor recently came out with a declaration for a cleaner city. The Mayor won his re-election.

More Pay for City Officials

Norfolk, Va.—Recognizing that the cost of living has greatly increased, the Finance Committee of the City Council has recommended that the pay of members of the police, fire, and street cleaning departments of the city be increased. The average increase in pay will amount to about 25 per cent.

Financial Stringency Due to Method of Assessment

Norfolk, Va.—The Finance Committee in a report to Council, says:

Enough has been said to indicate that it is absolutely essential for the city to exercise a high degree of conservatism and economy in making appropriations for the ensuing fiscal year. The fact cannot be too strongly emphasized that the condition of stringency now prevailing, as shown by this report, is simply a condition which will normally exist toward the close of any of the five-year periods for the assessment of real estate; and so long as the system of assessing real estate only at five-year periods continues, this condition will exist when those periods approach their termination. Your committee does not feel that the existing condition necessarily betokens past extravagances. It is true that there has been an enormous increase in municipal expenditures. The increase in the cost of living of which so much has lately been said, is reflected in demands for increased salaries and wages for city employees. In addition to this, just as the standards of living have increased so in similar measure have the standards of municipal living advanced, and conditions which were usual ten or twenty years ago would not at this time be tolerated.

To Run Pittsburg By a Commission

Pittsburg, Pa.—A committee on municipal affairs of the Chamber of Commerce, which has spent over a year in thorough study of the local situation and of experiments made elsewhere, will report to the Chamber in favor of a commission form of government for the city of Pittsburg. The new plan will probably be submitted to a meeting of allied civic organizations April 18, and a bill presented to the next Legislature for the amendment of the city's charter, to provide the election of eight city directors and a Mayor. Each of the nine members of this board of government will be paid a salary of $8,000 in order that they may devote their entire attention to city affairs. The commissioners will be heads of various departments and will also take the place of the present Councilmanic bodies.

Georgetown Votes to Join Seattle

Seattle, Wash.—By a vote of 389 to 238 Georgetown has voted to become a part of Seattle. The city of Georgetown is entirely surrounded by territory belonging to Seattle, and efforts have been made for many years to bring about annexation.

New Jersey Legislative Bills Signed

Trenton, N. J.—The following bills were signed by Governor Fort:

Authorizing Asbury Park to issue temporary loan certificates for the erection of recreation pavilions.

Authorizes municipalities governed by Commissioners to acquire land for park purposes.

Supplements the general borough act by authorizing the issuing of certificates of indebtedness for certain specified public purposes.

Authorizes Freeholders to improve as county roads sections lying within one municipality of a county.

Authorizes a limited rebate on water furnished by municipalities.

Appropriates $500,000, payable in five annual instalments, as New Jersey's share in the construction of the proposed Henry Hudson Drive along the Palisades.

Authorizes township committees to provide for the lighting of roads used for more than 20 years.

Permits Hudson and Essex counties to reconstruct streets extending into the different municipalities.

Authorizes the assessment of real estate used for public water supply belonging to one municipality and situated in another.

Makes it unlawful to lay any pipe on lands of the State under tidal waters without permission of the Governor and the Riparian Commissioners obtained in writing.

Gives Harbor Boards control over streets 300 feet back from water fronts.

Authorizes two or more municipalities to maintain a joint sewerage system.

Authorizes municipalities to sell or lease public lands.

Authorizes cities to contract with street railways for the transportation of garbage and ashes.

STREET CLEANING AND REFUSE DISPOSAL

May Collect Waste In Seven-Yard Trolley Cars

Chicago, Ill.—Transportation of the city's waste by 100 or more dump cars is under consideration by Superintendent of Streets Frank T. Fowler, Mayor Busse and Commissioner of Public Works John J. Hanberg. Mr. Fowler favors a car that would cost $800 and have a capacity of seven wagon loads. A Chicago concern offers to begin supplying them within ten days after the order is given. It is planned to operate the cars at night when they would not interfere with passenger travel. Some of the wagon hauls are now very long and cost from $3 to $3.50 for a single load.

Begin Burning Garbage

Milwaukee, Wis.—One of the four furnaces in the new refuse incinerator was started April 7 for the first time. Garbage was taken to the plant and disposed of without fuel. Others will be started within a week. After the official test the plant will be turned over to the city.

Begins Collection of Garbage with a New Equipment

Mt. Vernon, N. Y.—Frank Nordone began the collection of garbage per contract last week, with a brand new equipment for the work, including eight wagons of latest design. The outfit was drawn up in front of the City Hall at an early hour, and was inspected by the Mayor and several other city officials. Mayor Fiske was pleased with the equipment, and expressed himself as being satisfied that it was one of the best furnished by any contractor who had charge of the garbage collection.

Plan to Prevent Skidding

New York, N. Y.—Plans were formulated by the National Highways Protective Society at a meeting held last week to prevent automobiles from running down children in the streets of New York on account of private corporations sprinkling the pavements and allowing the water to remain in uneven places. The society says this causes skidding, and several children have been seriously injured thereby. A letter was directed to Commissioner Edwards asking him to cooperate with the society and suggest means for changing the conditions.

Street Cleaning Department Asks Cooperation

Washington, D. C.—Commissioner John A. Johnston is determined to get this city cleaner than it ever has been before, and to that end he has effected a cooperation between the police and the street sweepers. A few days ago the police captains in the sections of the city that are swept twice weekly by machines had their men hand to every householder a little card reading:

> The Commissioners of the District of Columbia are desirous of having the streets and alleys kept as clean as possible by the street sweepers and desire to enlist your co-operation to the end that, in having your front pavement swept in the mornings on Mondays, Wednesdays and Fridays, you will please have it done before the hour of 8 o'clock, in order that the sweepings may not remain after the street sweepers have passed over your street. Your assistance is earnestly solicited.

On other cards was specified the days, according to the schedule for machine sweeping in the section circularized. The machine-swept sections are the outlying parts of the city. The white wing section is the comparatively small center and business section of the town. The white wings sweep their sections every day, but the machine squads run over their territory every other day. This machine-swept section comprises about all of the residence sections of the city. It is in these streets that the householders are asked to be careful. The idea of the Commissioner and Superintendent Wood is that it makes no difference how much dirt the housewife or the maid sweeps into the gutter, provided it is swept out before the machine sweepers come along that day. If the householder waits until after the streets are cleaned and sweeps a bushel of trash out to the gutter, then it will not be long before the wind blows most of it up and down the street, in front of other houses and making a dirty looking neighborhood in general. Besides that, it will be perhaps two days before the machine sweepers come along again.

Leavenworth to Be Known as "The Clean City"

Leavenworth, Kan.—It is the purpose of the City Commissioners to keep the city cleaner this summer than it has ever been before. This matter is under the immediate care of Commissioner Marquis, and it is his ambition to have Leavenworth known as "The Clean City." The city has two large tank wagons for washing the streets and eight garbage wagons for hauling away the refuse from the dwellings. These garbage wagons will be kept busy during the day in the residence portion of the city and at night one of them will do the work in the business part of the town.

Ordered to Sweep Streets, Firemen Resign

Wooster, O.—Every member of the city's Fire Department but Charles Kingsley, the Chief, has resigned, to take effect April 1. The men decided to quit the Department because ordered to put in a portion of their time in street sweeping.

County Jail Inmates Clean Pulaski Streets

Pulaski, N. Y.—Street Commissioner George H. White has just entered upon his duties, having been appointed last week by the Board of Trustees. A force of fifteen or twenty prisoners from the county jail is now employed in cleaning the streets and South Park.

RAPID TRANSIT

Bill Gives Right of Street Railroad to Use Another's Tracks

Albany, N. Y.—Assemblyman Ebbets introduced a bill permitting one street railroad to use the tracks and electrical equipment of another street railroad in New York city for any distance, the present law limiting such use to 1,000 feet. This bill emanates from the Manhattan Bridge 3-cent line, and is the latest move on the part of that company in its efforts to construct a railroad from the North River to the Flatbush Avenue terminal of the Long Island Railroad, using the tracks and equipment of the Metropolitan system in Canal street, and of the Brooklyn Rapid Transit system of Fulton street and Flatbush avenue.

$60,000,000 for Subways

New York, N. Y.—The Board of Estimate has decided to put aside $60,000,000 for the building of new subways. Of this amount $13,000,000 will come out of the city's greater borrowing capacity, which will be available when the increased valuations on real estate go into effect on July 1. The rest of the money will represent the deductions from the existing indebtedness when the enabling act is passed by the Legislature, permitting the city to take out of the city's bonded debt the stock issued for the building of the present subway. It is estimated that such stock amounts to about $47,000,000 and this sum together with the $13,000,000 will be reserved for the building of the Broadway-Lexington route in this borough, the Broadway-Lafayette line in Brooklyn, the Fort Hamilton and Coney Island extension of the Fourth Avenue (Brooklyn) subway, and the Canal street crosstown subway in Manhattan.

Ask for Competition in Franchise

Toledo, O.—A petition is being signed by citizens requesting the Council to advertise for bids for a street railway franchise. The petitions mention that if no action is taken until present grants expire the city will practically have to accept whatever terms are offered it by the Rail-Light, and it is therefore suggested that other companies at once be given an opportunity to submit bids so that there may be no interruption in service. The plan is that, after advertising for bids, the city map out routes, substantially the same as now covered by Rail-Light grants. It is said the laws invoked by the Robisons a number of years ago could be used to take possession of the streets. The present company would have the advantage of the plant and equipment now in use in making bids for the franchise, though the petition recites that action by council should be immediate so that if another company should be granted a franchise on the streets where the Rail-Light grants expire this year, time would be given such company to equip a plant before November.

MISCELLANEOUS

City Engineer Lectures on Municipal Engineering

Binghamton, N. Y.—"Municipal Engineering" was the subject of a talk by City Engineer John A. Giles to the class in civil engineering at the Library. He took up the different divisions of enginering, making special reference to municipal engineering work on highways, sewage disposal, disposition of municipal wastes, bridges, grade crossings, electric lighting plants, water works, parks in relation to landscape and many other branches of the work. Structural designs conforming to safe building codes were given much discussion. The necessary anticipation of the future growth of cities, proper designing of suitable sewerage systems and special mention of the contemplated sewage disposal plant for the city of Binghamton were interesting features of Mr. Giles' talk.

Abattoir Interferes With Proposed Park Improvement

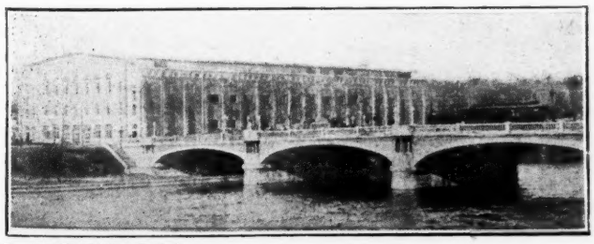
Boston, Mass.—The city's sanction to a rendering company at the Brighton abattoir to continue its business, renewed in the past week, limited the period of the present permit to two months and directed public attention anew to the present situation of the abattoir and its relation to the Metropolitan Park Board's work of development in the lower banks of the Charles River. There is pending in the Legislature a bill, accompanying a petition by Charles W. Eliot, president emeritus of Harvard University, and others of Cambridge, directing the Metropolitan Park Commission "to acquire, on or before Sept. 1, 1910, for park purposes" that portion of the abattoir land bordering on the Charles River. The width of the land to be taken is left to the discretion of the Commission. The taking of the land would include also the "riparian rights and rights of navigation appurtenant thereto."

Improvement in Market Conditions Urged

New Orleans, La.—Miss Harriet C. Barton, chairman of the sanitation committee of the Woman's League, has made a report on present market conditions and needed improvements, which the League has indorsed and submitted to Mayor Behrman. Miss Barton says that she found no evidence of neglect or indifference in regard to the care of the markets. Water plugs are needed at two of the markets, their absence making it impossible to clean the markets properly. Better facilities for washing out all the markets are needed. Miss Barton points out the apparent neglect of the city to provide protection of the markets from flies and dust. Stables where flies breed are found within a square of every market. The importance of screening the markets entirely, or at least those portions of them reserved for fish and meat. Stables in the vicinity of markets should be registered and inspected and their owners forced to keep them clean. The open character of the buildings, so made to promote the circulation of air, makes it all the more essential that they should be protected by screening. Regarding the market people, the report says that they were all found anxious to have things clean, and so far as conditions were under individual control, cleanliness was the rule.

New Bridge and Coliseum at Des Moines

Des Moines, Ia.—The illustration shows the new Locust street bridge and the Coliseum, the largest convention hall in Iowa, both built within a year. The bridge cost $150,000, the Coliseum $145,000. The Coliseum was built by public subscription, and is considered as the most modern convention hall in the United States. It will seat 10,000.

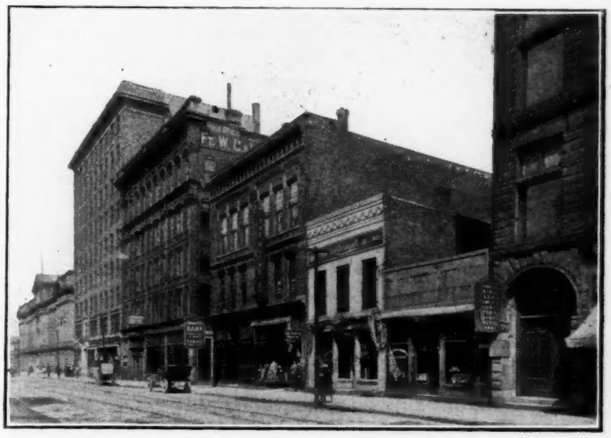


Courtesy Des Moines Capital

NEW BRIDGE AND AUDITORIUM, DES MOINES

Steps in Fort Wayne's Progress

Fort Wayne, Ind.—This interesting picture gives a good view of the new nine-story Shoaff Building, erected on the site of the Aveline Hotel, which was destroyed by fire two years ago, and in which fourteen people lost their lives. The building next to it is the Bass Block, owned by John H. Bass, Fort Wayne's richest man, and it houses the First National Bank. The latter institution, which is the largest financial institution in the State outside of Indianapolis, will shortly move to elaborate new quarters in the Shoaff Building, and the place it vacates will be occupied by the Tri-State Loan & Trust Company, the biggest trust company in the State, outside of the capital. An interesting feature in connection with these buildings is that their size is just the reverse of their age, with the exception of the two smallest buildings. That is to say, the biggest building is the youngest and the smallest is next to the oldest, the second smallest being the oldest of the five.



PROGRESS IN BUILDING CONSTRUCTION, FORT WAYNE, IND.

Attempt to Regulate Storage of Rags

Chelsea, Mass.—Judge Bosson in the Chelsea police court has nullified the second effort of the Board of Control to regulate the storage of rags. The court held that the word "rag" as defined in the dictionary does not include new clippings "of worsted cloth serviceable for patching." One of the first things done by the Board after the fire was to prohibt rag shops unless regulated by the Chief of the Fire Department. Most of the rag dealers in Chelsea re-established their rag shops without a license, and in a case to test the validity of the ordinance the Supreme Court decided that the Board of Control had no right to delegate the power of licensing. When the Board made its second ordinance Chelsea had almost as many rag shops as before the fire. It is probable that still another effort will be made to regulate the business.

Town Takes Both Sides on License Issue

Union Grove, Wis.—The village of Union Grove finds itself in a peculiar condition. The wets carried the town by a vote of 81 to 80. At the same time a set of no-license officers were elected, and it is said that the Town Board can refuse to grant a license to any saloon if they desire.

New Borough Is Progressive

Wyomissing, Pa.—Although a borough since July 2, 1906, only, this town is showing Readingites and citizens from many other large towns and cities that "improvement is in order," and that it is willing to be judged by its public buildings and fine private homes. The citizens began to improve the town by laying out a series of wide streets and boulevards, dotted with fine maple trees and grass plots—the prettiest streets of any town in Berks County, not even barring Reading, with its boulevard encircling Mt. Penn. Having accomplished all this and built a schoolhouse, the new borough wanted a home of its own, so they got Council to act, and they have just about finished a beautiful town hall that would even be a credit to Reading. The cost of the Town Hall, with all its furnishings, amounts to about $28,000.

Cheap Municipal Theatres vs. Moving Picture Shows

Chicago, Ill.—Electric theatres should be owned by the municipality for the purpose of improving the morals of our young, is the opinion of Chief of Police Steward, who made the suggestion to Ald. Beilfuss, of the Small Parks Commission. The Alderman will lay the matter before the proper Aldermanic committee. Chief Steward believes in the educational value of the well-conducted five-cent theatre, but realizes the damage improper shows do. He explained the trouble in revoking licenses and said such things as proprietors permitting children to smoke cigarettes and otherwise misbehave behind the scenes would not be possible if he could get the theatres under his jurisdiction. The theatres ought to be established in the small parks, he says, and only adults should be charged the full five-cent price of admittance—children under 16 might be charged two cents, under 10 years of age one cent, or be admitted free. The Chief thinks also that the theatres should be constructed of corrugated iron, so that they could be moved about and used for voting purposes or supplementary schoolrooms in the crowded districts.

Holyoke Takes Playground Act Seriously

Holyoke, Mass.—The city of Holyoke is taking the playground act most seriously, and Building Inspector Frank O'Connell, who is to be general supervisor of the playground activities, has already mapped out the season's campaign, which will begin the last of May. There are three large skating rinks opened and maintained by the city during the winter time, each one of which will be used as a wading pool during the summer months. The total expended for the three was less than $50, and Mr. O'Connell points to the fact that no Holyoke children were drowned while skating the past season, although in previous years one or two drowning accidents always occurred, and often five or six. Prospect Park and Riverside Park were equipped with playground apparatus by the Board of Park Commissioners previous to the passage of the playground act, and will be continued along the same lines as last season. Three new playgrounds will be fully equipped, located as follows: West street, in Ward 1; Hampden street, between Linden and Beech, and Maple street north of Cabot street. The equipment of each will include a baseball field, swimming pool, boys' outdoor gymnasium, girls' outdoor gymnasium, a green for dances and a wading pool. In addition there will be playground apparatus of a minor nature, such as sandboxes, swings, teeters, etc., at six of the schoolhouses, Highlands, South Chestnut, Elm street, Kirtland, Park and Appleton streets. About $30,000 will be spent. It is estimated that between 3,000 and 4,000 children will be accommodated in pleasant weather. The $30,000 spent will be largely for permanent apparatus and grading, so that another year the bill will be but a fraction of the amount expended this year.

City Autos to Be for General Use

Minneapolis, Minn.—E. R. Dutton, Assistant City Engineer, was instructed by the City Council Ways and Means Committee to allow C. A. Bloomquist, City Treasurer, to use the city automobile assigned to him for official business. The City Treasurer will use it twice a month in distributing pay checks to city employees, thus saving rental expense of $25 to $50 a month. It has often happened that the car assigned to the engineer was lying idle while other city officials were paying $4 an hour rent for automobiles for official business. Last year $400 was expended in automobile hire by the City Treasurer's office. At the last election the City Clerk spent $269 for similar purposes.

To Mark Historic Sites

Washington, D. C.—First steps toward placing permanent markers on historic sites within the District were taken at the New Willard Hotel at a meeting of the committee to accomplish this work. W. P. Van Wickle is chairman of the committee, which was appointed by the Commissioners. The committee is permanent in its character. It is expected that by Independence Day at least one or two prominent historic sites in the city will be marked with a suitable bronze tablet or some other equally permanent form of identification.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Water Companies—Contracts—Free Water

Vinton-Roanoke Water Co. vs. City of Roanoke.—A water company which contracts to give a city the free use of necessary water for its public market house, court house and jail, and other public buildings, including buildings for fire companies and public school buildings, need not furnish water free of charge to fish sheds owned by the city and in existence at the time of the contract and leased by the city to individuals who pay rent therefor, especially where the city and the company for several years construed the contract so as not to require the company to furnish such water. An ordinance granting a franchise to a water company, which provides that the company shall furnish, free of charge, water to public buildings, but shall not be put to any expense in constructing and maintaining the pipes, etc., necessary therefor, and furnish free water for troughs for horses and public drinking fountains, so situated as not to necessitate the laying of additional mains, and which provides that the city shall furnish at its own expense the troughs and drinking fountains, and place the same in position, and which binds the company to furnish water, free of charge, to fire hydrants at such points as the city may designate, along streets where the company has laid its mains, but the city shall furnish the fire hydrants at its own expense, requires the company to allow the city to use the water free of charge for fire hydrants, but the city must pay the cost incidental to connecting itself with the water mains, and when the company has laid its mains along streets, where the city may connect and use the water, its obligation to the city is discharged.—Supreme Court of Appeals of Virginia, 66 S. E. R., 835.

Diversion of Water—Damages

Fischer vs. Trustees of Village of Clifton Springs.—The court, in a suit to restrain the diversion of water and for damages, may grant injunction, though only nominal damages are established. A riparian proprietor has, as a general rule, the right to demand that the stream shall flow through his land in its usual quantity. A municipal corporation, which diverts and diminishes the flow of water in a natural stream from the lands of another by the operation of a water works system, is liable in damages. One who actively engaged as Water Commissioner in the construction by a city of a water works system, which diverted water from the land of another, could not, on subsequently purchasing the land with knowledge of the diversion, sue the city to enjoin the diversion and for damages.—New York Supreme Court, 121 N. Y. S., 163.

Market House Public Street

Peters et al., Market Commissioners, vs. City of St. Louis et al.—A city possessed of the powers of controlling the streets, and also of establishing, controlling and regulating market places, cannot, in exercise of the latter power, authorize by ordinance the erection of a brick building to be used as a market place in the center of a dedicated street, since, where land has been dedicated to public use as a street, it cannot be diverted from that use.—Supreme Court of Missouri, 125 S. W. R., 1134.

Streets—Establishment of Grade

Collins vs. City of Iowa Falls.—Where a street grade was established and an abutting owner improved her property without reference to the grade before the street was actually lowered to the grade established, she was not entitled to damages to her property by the subsequent lowering of the street to the established grade.—Supreme Court of Iowa, 125 N. W. R., 227.

Contractors' Bonds—Informality

Waterous Engine Works Co. vs. Village of Clinton.—While the requirements of the statute must be strictly followed, in order that a bond may be a statutory bond, a variance or omission, to be fatal, must be material.—Supreme Court of Minnesota.

Government and Corporate Duties—Flushing Sewer

City and County of Denver vs. Maurer.—Where a storm sewer constructed by a city to carry away surface waters formed a part of the improvements of the streets, and pertained primarily to the care of the streets, the act of the city in flushing the sewer was but an act necessary to keep the streets in a reasonably fit condition, and was in the performance of a private and corporate duty, though the act was also done to remove a menace to the health of the people, and it was liable for the negligence of its employees in the performance of the work. The fact that a city has employed a general method for flushing its storm sewers for a long time without any accident to pedestrians may be evidence of the exercise of reasonable care, but is not conclusive, and the question is for the jury.—Supreme Court of Colorado, 106 P. R., 875.

Assessments—Appeal—Conflicting Evidence

In re City of Seattle.—An objection that municipal improvement assessments are unequal and unjust, overruled by the trial court, will not be sustained on appeal where evidence is conflicting.—Supreme Court of Washington, 106 P. R., 755.

Contracts—Bonds

City of Spokane vs. Costello et al.—Whatever lack of power there may have been in a city Board of Public Works to arrange to pay a contractor in full and take a bond with surety for the completion of a defective sidewalk, his administrator and the surety, defendants to an action on the bond, are estopped to raise a question of ultra vires as to powers of the city or board in such case.—Supreme Court of Washington, 106 P. R., 764.

Milk Regulation—Ordinances and Statutes

Salt Lake City vs. Howe.—An ordinance made it unlawful to bring milk into the city to sell or offer for sale without a permit from the City Dairy and Food Commissioner, and imposed a penalty for its violation of not less than $50 or more than $200, or by imprisonment in the city jail for not more than 100 days, or both. Comp. laws 1907 creates the office of State Dairy and Food Commissioner, prescribes his powers and duties, and prohibits the sale of improper milk and other dairy products, but does not otherwise regulate the sale of milk or require a license for its sale. The penalty imposed for its violation is a fine of not less than $50 or more than $200. Held that, as the statute did not prohibit and punish the same acts as the ordinance, the latter did not conflict with the statute in imposing a different penalty than provided by it, and was valid. Comp. laws 1907, permitting the punishment of violations of ordinances by fine in any sum less than $300, or imprisonment not exceeding six months, or both.—Supreme Court of Utah, 106 P. R., 705.

Personal Injuries—Question for Court

Asbill vs. City of Joplin.—In an action against a city for personal injuries from falling over a wire stretched across the sidewalk, where plaintiff testified that there were no lights or barriers to notify her that the wire was across the walk, and two witnesses for defendant testified that a barrier and light were properly placed early in the evening, whether a verdict should be directed for defendant was for the trial court.—Springfield Court of Appeals, Missouri, 124 S. W. R., 22.

Counties—Taxes—Special Assessments

Smith et al. vs. Board of Commissioners of Hamilton County et al.—Special taxes for road improvements proceed on the theory that the tax is returned to the person or property paying it in the form of special benefits, and hence bonds issued for the construction and improvement of highways do not constitute a debt of the county or township within the Constitution, limiting indebtedness.—Supreme Court of Indiana, 90 N. E. R., 881.

Defects in Streets—Crosswalks

Cochran vs. City of Springfield.—A city is required to keep all of its walks in a reasonably safe condition, and a person using them need not exercise greater care while on a crosswalk than upon ordinary sidewalks.—Springfield Court of Appeals, Missouri, 124 S. W. R., 53.

Injuries by Electric Light Wires

City of Danville vs. Thornton.—No relation of master and servant, or any other contractual relation, between defendant city and plaintiff, is necessary that plaintiff, who, while on the pole of an electric company lawfully in a street to do work on it for the company, was injured from contact with an insufficiently insulated and heavily charged electric wire of the city close to such pole, may recover therefor. One maintaining highly charged electric wires is under the duty of exercising the utmost care to keep the wires perfectly insulated, where others have the right to go for any purpose. One who, in the course of his employment, is brought close to electric wires, is not guilty of contributory negligence by coming in contact therewith, without looking for latent defects, of which he was ignorant, unless done unnecessarily, or without proper precautions for his safety.—Supreme Court of Appeals of Virginia, 66 S. E. R., 839.

Fire Company's Right to Trophy

In re Council of Fire Department of Village of Hempstead et al.—Where a village fire department, governed by a Council under village law, accepts a trophy to be contested for each year by the different fire companies, the one winning it three times to hold it for its own, and the P. Hose Company wins it twice, but the third time the Council withdraws it from contest without right, the hose company cannot get title to the trophy by arranging and winning an unofficial contest in spite of the Council's action. In such case the Council cannot compel the hose company to give up possession of the trophy, though it wrongfully had the third winning engraved thereon and claimed it as its own, since no one had a better right to it than it had.—New York Supreme Court, 121 N. Y. S., 359.

Contract—Suit by Taxpayer

Kimmerle et al. v. Village of Cassopolis et al.—A bill by freeholders and taxpayers of a village to set aside contracts for water and light for the village, which does not state that the complainants will sustain any pecuniary loss because of the contracts, and which merely avers that one of the complainants is a member of the Village Council and is opposed to the contracts, and that the value of the matter involved exceeds $1,000, is properly dismissed, because not showing that complainants are sufficiently interested to entitle them to sue, the case not being within the exception in Comp. Laws, authorizing the dismissal of suits concerning property except where the matter in dispute exceeds $100.—Supreme Court of Michigan, 125 N. W. R., 65.

Public Nuisance—Special Injury

Collins vs. City of Keokuk.—In an action by an individual citizen against a city to abate public nuisances by obstructions in its streets, the petition should show injury or prejudice to plaintiff therefrom other than or different from that suffered by inhabitants of the city in general, as otherwise his action will not lie.—Supreme Court of Iowa, 125 N. W. R., 231.

Ordinances—Validity—Discrimination

Cole vs. Village of Culbertson et al.—A village ordinance is not discriminating which prohibits the keeping of a billiard or pool hall or the maintaining of tables for hire, and does not prohibit keeping them for private or free use.—Supreme Court of Nebraska, 125 N. W. R., 287.

Violation of Ordinances—Accessories

Stradley v. City of Atlanta.—All who violate or assist in violating a municipal ordinance, directly or accessorily, are equally guilty as principals.—Court of Appeals of Georgia, 67 S. E. R., 107.

Drinking Fountain in Street

Levy et al. vs. City of Elizabeth et al.—Power conferred on a society for the prevention of cruelty to animals to locate drinking fountains in the streets is not a concession of public right in the street, so as to require the passage of an ordinance, rather than a resolution, to effectuate it.—Supreme Court of New Jersey, 75 A. R., 312.

NEWS OF THE SOCIETIES

International Police Association.—Preparations are being completed for the seventeenth convention, to be held at Birmingham, Ala., May 10-15. Chief George H. Bodeker has received a return of the programme which he had sent to Major Richard Sylvester, Washington, D. C., the president of the organization, for his approval. The convention will hold its sessions at the headquarters at the Hotel Hillman. The programme which Chief Bodeker has prepared is very elaborate, and when followed out will make the four days which the convention is in session one long round of business, pleasure and sight-seeing. B. M. Allen, a prominent attorney of Birmingham, will preside at the head of the table Friday evening, May 13, at the banquet at the Hillman. Between 600 and 800 covers will be laid at the banquet. The entire Board of Aldermen will be invited to the banquet, and also the heads of the city departments. All of the business meetings will be held in the large convention room on the second floor of the hotel. Following is the complete programme as prepared by Chief Bodeker and Major Sylvester:

Tuesday, May 10.—Nine-thirty a. m., call to order by the president; prayer by the Rev. L. C. Branscomb, pastor of the First Methodist Church; 9.45 a. m., address of welcome, Hon. Frank P. O'Brien, Mayor of Birmingham and Chairman of Police Commissioners; response, Maj. Richard Sylvester, President International Police Association; appointment of committees; applications; call of roll, payment of dues; report of credentials' committee; election of members; address and report of president; report of secretary-treasurer; 12.30 p. m., an old-fashioned Southern barbecue; cars in wating to transport party to East Lake; 8 p. m., Bijou theatre party to members, their families and friends.

Wednesday, May 11.—Nine a. m., call of roll; report of credentials' committee; report of special committee; reading of communications; presentation of papers and discussions; 1 p. m., automobile races; cars in waiting to transport party to the fair grounds; 8 p. m., presentation of papers and discussion.

Thursday, May 12.—Nine a. m., presentation of papers and discussion; 11 a. m., visit to Ensley, cars in waiting to view the largest steel mill in the United States; thence to Bessemer, Ala., as guests to Chief Wallace and other officials of that city.

Friday, May 13.—Nine a. m., unfinished business; new business; miscellaneous; election of officers; 4 p. m., automobile ride; 8 p. m., banquet Hotel Hillman.

Saturday, May 14.—Nine-thirty a. m., unfinished business; selection of place of meeting; resolutions; adjournment.

Following are the names of the citizens appointed by Chief Bodeker to act as members of the three committees:

Committee on Arrangements.—John L. Parker, chairman; Hal J. Copeland, T. F. Parker, D. J. Fox, Culpepper Exum, T. C. McDonald, William E. Weir, F. B. Yeilding, Ben Martin, George H. Bodeker.

Committee on Entertainment.—F. P. O'Brien, chairman; Carl H. Seals, Jake Burger, E. W. Barrett, J. A. VanHoose, W. R. McGavock, Eugene Fies, George B. Ward, George M. Cruikshank, George M. Howell, Dan Donahue, George H. Bodeker, Louis Saks, F. Caheen, W. M. Drennen, B. M. Allen, E. C. Crow and J. R. Hornaday.

Finance Committee.—J. B. Babb, C. W. Ufford, Frank Nelson, Harry Jones, A. H. Ford, George H. Bodeker.

Toastmaster.—B. M. Allen.

Southern Engineering Association.—The Birmingham district branch held a meeting April 7 at the University of Alabama, Tuscaloosa, at the invitation of Dr. Edgar B. Kay, Dean of the Engineering Faculty. The new equipment of the engineering laboratories was inspected. Many of the visitors expressed the opinion that no more complete laboratory could be found in the South and that the university's equipment would stand comparison with any in the country.

Louisiana State Firemen's Association.—The executive and legislative committee of the Louisiana State Firemen's Association held a meeting at the David Crockett Company No. 1 Hall, Gretna. The subject of the 2 per cent law, which has been enacted in a large number of States for the benefit of the fire departments, was taken up and acted upon. It was decided to ask the General Assembly to enact a similar law in Louisiana for the improvement and protection of the fire departments. The committee gave its approval to a bill to be submitted at the coming session of the Legislature. James B. Heeney, a member of the insurance committe of the National Firemen's Association, suggested that the bill be given to several lawyers for their legal opinion, stating that in the experience of the National Association the insurance companies at once carried the law into the courts to test its constitutionality. The firemen of South Carolina, at the 1906 session of the General Assembly, had a 2 per cent law enacted, and it was at once taken into the courts by the insurance companies doing business in that State, and it was declared unconstitutional. At this session of the Legislature another bill was introduced by the State Association, known as the Garris firemen's aid act, and has become a law, having just been signed by Governor Ansell. The insurance companies are agan talking of testing it out in court, but the firemen of South Carolina have worded the bill too carefully this time to enable the underwriters to get around the constitutional objections, and that is what the firemen must be sure of—the wording of the bill—so as not to have any flaws in it. It was then ordered that the matter be laid over until the next meeting of the committee for further consideration.

Virginia State Firemen's Convention.—Awards of money prizes will be made at the State firemen's convention at Alexandria, August 24-26. The prizes announced are:

For the largest in point of number and best uniformed company in line with band, that is a member of the Association, $100. Prizes of $50 and $25 are for the second and third largest and best uniformed companies.

A prize of $25 is for the largest and best-appearing uniformed company in line of march from out of the State.

For hose races a first prize of $100 is offered for State companies only. The winner acquires possession of the Association trumpet. A second prize of $50 is offered.

For the hose race, open to all companies, a prize of $100 is offered, and the second competing company will be awarded $50.

A band concert will be given the second night of the convention at King and Washington streets. Competition for a prize of $50 is open to all bands with visiting fire companies.

American Society for Testing Materials.—In accordance with a call issued by Walter Wood, chairman, and Dr. Richard Moldenke, secretary, a meeting of Committee B, on cast iron, of the society was held at the Engineers' Club, 1317 Spruce street, Philadelphia, on April 16. The chairman reported on progress made in the past year in the international specifications, particularly as to the grading of pig iron, and gave an account of what took place relative to the work of the committee at the Copenhagen congress in September, 1909.

Canadian Society of Civil Engineers.—At a meeting in Montreal, April 7, a paper by H. S. Hancock, Jr., on the "Fort William Water Supply" was read by R. S. Lea, in the absence of the author.

American Government Accountants.—Le Grand Powers, president of the Association of American Government Accountants, said, in the course of an address at the Public Library, April 5, that it is entirely possible for the United States Government, by establishing standards for work and living up to and beyond these standards, to double, and perhaps triple, the efficiency of the accounting forces of the Government. As an example, Mr. Powers spoke of work in the agricultural division of the Census Office. There are certain schedules standardized there so that each bit of work is classed as a unit, to occupy seven and a half minutes of a clerk's time per unit. The first schedule occupied fifty minutes, but with the standard in mind the entire job was cut down to an average of less than the standard time. If this system were applied to all branches of Government work, said Mr. Powers, the Government would be much better off in its accounting departments. He said that private business managements are approaching their problems in this way with good results.

American Electrochemical Society.—The seventeenth general meeting of the American Electrochemical Society will be held at Pittsburg, May 5, 6 and 7. The professional and business sessions will be held at the Fort Pitt Hotel. On Wednesday afternoon, May 4, if a sufficient number of members is then present, a visit of inspection will be made to the technological testing plant of the United States Geological Survey. Sessions for the reading and discussion of papers will be held Thursday morning, May 5, Thursday evening and Saturday morning. The programme of excursions includes visits to the Park works of the Crucible Steel Works Company of America, the Carnegie Steel Company's dry blast plant at Isabella furnaces, the Jones & Laughlin Steel Company's Talbot plant, the Firth Sterling Company's works at Demmler, where the Heroult electric steel furnace is in operation, and the Carnegie Steel Company's Homestead works, where a new type of combined open hearth and electric furnace is in operation. A dinner will be given at the Fort Pitt Hotel Friday evening and lunch at the Hotel Schenley Saturday at 1 P. M. A general public meeting has been planned for Saturday afternoon, at which there will be addresses, illustrated in part, on the present status of the electrochemical industries and on the conservation of power resources. Altogether a pleasant and instructive program has been arranged.

American Society of Mechanical Engineers.—At the meeting of the society to be held April 12 at the Engineering Building, No. 29 West Thirty-ninth street, New York City, and with which the American Institute of Electrical Engineers will co-operate, and the question of electric drive in the machine shop will be considered. Papers will be presented as follows: "The Economy of the Electric Drive," A. L. De Leeuw; "The Economical Features of Electric Motor Applications," by Charles Robbins; "Mechanical Features of Electric Driving," by John Riddell; "Selection and Methods of Application of Motors and Controllers," by Charles Fair. There will be a discussion by prominent engineers and by the president of the Machine Tool Builders' Association, the efforts of which for standardization of electric motor equipment will be reported.

Kansas Municipal League.—Mayor C. L. Davidson of Wichita has announced part of the program of the meeting to be held in Wichita, May 18 and 19. In arranging the program Mr. Davidson was assisted by Prof. Frank G. Bates, of Kansas University. The coming meeting will be the first one of the league, which is composed of the Mayors of all the Kansas cities. David E. Heineman, of Detroit, Mich., President of the League of American Municipalities, will speak. Burns & McDonnell, hydraulic engineers, of Kansas City, Mo., will give an illustrated lecture on sewage disposal. Mr. Deacon will represent the State Board of Health in a lecture on "The Relation of the Health Department to the Municipal Officers."

Boston Society of Civil Engineers.—Garbage was the subject of discussion at a special meeting of the society, March 30. The principal paper was presented by Col. William F. Morse, New York, who reviewed the history of garbage disposal and explained the workings of modern reduction and destructor plants. The author expressed the opinion that garbage properly utilized should return a revenue to the municipality. He spoke of the dangers incident to the reduction process, saying that fires and explosions had occurred in many of these plants. Willis C. Merrill, manager of the Sanitary Waste Disposal Company, Boston, favored the use of the reduction process, but doubted if the system could be made to pay a profit. Guy C. Emerson spoke of the garbage problem with special reference to local conditions. In Boston he thought that disposal could only be effected at considerable cost. The product of incineration, clinker, was of less value in Boston than in some cities on account of the low cost of stone and gravel there.

Florida Electric Light and Power Association.—The convention met at Tampa April 11. The following officers were elected: F. E. Fletcher, assistant manager of the Tampa Electric Company, president; W. C. Bostwick, of Jacksonville, vice-president; H. C. Adams, West Palm Beach, secretary and treasurer; J. H. Scales, of Perry, and E. C. Bennett, of Ocala, directors. Jacksonville was decided on as the next convention city of the association.

Clinton Hill Improvement Association, Newark, N. J.—At the annual banquet in the Kruger Auditorium, April 6, J. Horace McFarland, president of the National Civic Federation, delivered an address containing suggestions as to the improvement of the city. He spoke particularly of the need of making the approaches to the city attractive.

Good Roads Association of Nebraska.—The meeting was called to order in the Council Chamber April 8 by City Engineer Craig. Welcome on behalf of the city was extended by Mayor Dahlman. Prof. George R. Chapburn, president of the association, University of Nebraska, responded for the association. A. N. Johnson, Illinois State Engineer, delivered an illustrated lecture on "Utility and Uniformity of Methods and Material." Prof. George R. Chapburn delivered an address on "Good Roads, a Commercial and Social Asset." Dan V. Stephens, Fremont, spoke on the "Value of Good Roads to the Farmer." E. C. Simmons, State Engineer of Nebraska, gave an address, referring mostly to local conditions.

Southern Supply and Machinery Dealers' Association and American Supply and Machinery Manufacturers' Association.—The joint meeting at Jacksonville, Fla., last week of the societies ended with the election of officers as follows: American Association—S. P. Browning, Maysville, Ky., president; Henry P. Lupton, Pittsburg, first vice-president; D. K. Swartwout, Cleveland, O., second vice-president; F. D. Mitchell, New York, secretary and treasurer. Southern Association—President, H. C. Clark, Birmingham, Ala.; first vice-president, R. B. Lebby, Charleston, S. C.; second vice-president, W. G. Thomas, Memphis, Tenn.; secretary and treasurer, Alvin M. Smith, Richmond, Va. Papers were presented by E. Howard Smith, vice-president and general manager of the Superior Supply Company, Bluefield, W. Va., on the employment of salesmen on commission or on a profit-sharing basis; by W. P. Simpson, of the C. T. Patterson Company, New Orleans, on the advantages that have been derived by the adoption of resale prices and their support by the jobbers, and by N. A. Gladding, vice-president of the E. C. Atkins Company, Indianapolis, on practical results of the adoption of resale prices, and discussions of the benefits to be derived from local organization, of representation by manufacturers in dealers' catalogues, of the mutual obligations of manufacturers and dealers under exclusive agency agreements, and of other topics.

Intermountain Good Roads Association.—The board of control of the convention, representing eleven Western intermountain and Pacific Coast States, met at Ogden, Utah, April 5, and decided to build a mile of Mountain road as a demonstration during the next convention, to be held in Ogden September 23, 1910, at the time of the International Sheep Show and Four-State Fair. The United States Director of Roads will be in charge and will give practical elucidation of good-road building. An unique arrangement will be a call for every farmer in the county to be present with a load of crushed stone to facilitate the work and join in the ceremonies. The convention will have among its delegates all Western Governors, Congressmen and Senators. An effort will be made to have the Government set aside a million acres of the public land to each mountain State for road building purposes.

Commercial Club of Chicago.—Chicago, the future city of beauty, is to be boomed in a strenuous campaign conducted by the Commercial Club, according to plans laid at the thirty-second annual banquet of the club at the new Blackstone Hotel, April 9. To start the campaign, which will be a movement of publicity and lectures on the Chicago plan prepared by the club and intrusted to the Chicago Plan Commission, a fund of over $20,000 has been raised and other subscriptions are promised. The idea of inaugurating a campaign of education and publicity in support of the Chicago plan was broached several weeks ago. After the banquet the idea was made known to members of the club and a call for subscriptions was made. It was thought that about $15,000 would start the campaign. But when Charles G. Dawes read the list of subscriptions the total was nearly $30,000, the result of four days' work. Of this fund, $10,000 will be reserved to maintain the offices of the Commercial Club and the remainder will be used to start the real movement. The club proposes to present stereopticon lectures before clubs and civic organizations on the Chicago plan and the possibilities of transforming Chicago into the most beautiful city in the world. Chicago plan books, showing the changes which have been indorsed by the commission and the club, are to be placed in every public school in the country. The books will be a cheaper edition—costing about $3 or $4—than the present edition, whose cost is nearly $20 a volume. The demand for the books has been far greater than could be cared for. Following reports from sub-committees, the annual election was held, the result being: President, David R. Forgan; vice-president, Frank B. Jones; treasurer, Francis C. Farwell; secretary, Edward F. Carry.

Calendar of Meetings

April 20.
American Society of Civil Engineers.—Regular meeting, Society House, New York.—Charles Warren Hunt, Secretary, 220 W. 57th st., New York, N. Y.

April 26-30.
American Water Works Association.—Thirtieth annual convention, Grunewald Hotel, New Orleans, La.—J. M. Diven, Secretary, Charleston, S. C.

May 2-4.
National Conference on City Planning.—Second annual conference, Rochester, N. Y. Flavel Shurtleff, Secretary, 19 Congress Street, Boston, Mass.

May 5-7.
American Electrochemical Society.—Annual Meeting, Pittsburg, Pa.—Jos. W. Richards, Secretary, South Bethlehem, Pa.

May 6-7.
Appalachian Engineering Association. Annual meeting, Winston-Salem, N. C.—Harry M. Payne, Secretary, Morgentown, W. Va.

May 17-19.
National Fire Protection Association.—Annual Meeting, Chicago, Ill.—Franklin H. Wentworth, Secretary, 87 Milk Street, Boston, Mass.

May 23-28.
National Electric Light Association.—Annual meeting, St. Louis, Mo.—T. C. Martin, Secretary, 29 W. 39th st., New York.

May 27-29.
Louisiana State Firemen's Association. Fifth Annual Convention, Lafayette.—Wm. J. Kleinpeter, Secretary, Gretna, La.

May 31-June 3.
American Society of Mechanical Engineers.—Spring meeting, Atlantic City, N. J.—Calvin W. Rice, Secretary, 29 W. 39th st., New York.

June 1-4.
Engineers' Society of Pennsylvania.—Second Annual Convention, State House, Harrisburg, Pa.—Edward R. Dasher, Secretary.

June 22.
New England Water Works Association.—June Outing, Providence, R. I.—Willard Kent, Secretary, Narragansett Pier, R. I.

June 21-23.
Indiana Municipal League.—Annual Convention, Richmond.—Baltz A. Bescher, Secretary, Richmond, Ind.

June 30-July 1.
American Society of Heating and Ventilating Engineers.—Semi-annual Meeting, St. Louis, Mo.—W. M. Mackay, Secretary, P. O. Box 1818, New York, N. Y.

August 23-26.
International Association of Fire Engineers.—Annual Convention, Syracuse, N. Y.—James McFall, Secretary, Roanoke, Va.

August 23-26.
League of American Municipalities.—Annual Convention, St. Paul, Minn.—David E. Heineman, President, City Hall, Detroit, Mich.

September 14-16.
New England Water Works Association.—Annual meeting, Rochester, N. Y.—Willard Kent, Secretary, Narragansett Pier, R. I.

October 11-16.
American Society of Municipal Improvements.—Seventeenth annual convention, Erie, Pa.—A. Prescott Folwell, Secretary, 239 W. 39th st., New York, N. Y.

MUNICIPAL APPLIANCES

Cleaning Water Mains—Effect on Sanitary Condition and Rate of Flow—Results Obtained—Nature of Growths in Pipes

The effect of the unsanitary condition of water mains on the water passing through them is a subject on which there is little direct evidence. Turneaure and Russell, in their work on "Public Water Supplies," state that changes occur in the bacterial content of water during distribution; sometimes the bacteria are increased, sometimes decreased. Pipe lines contain a large variety of foreign substances. The National Water Main Cleaning Company, which makes a specialty of cleaning water mains, has in its New York office, in the World Building, a small museum of objects taken from water pipes. These include lanterns, coats, bricks, logs, incrustations, pipe moss, pipe sponge, snails, tubercules as big as a man's fist, and, in fact, almost everything conceivable. A majority of these substances have no direct injurious effect on the quality, except so far as they promote the collection of sediment. However, during the ordinary process of cleaning a main, when the scraper is passed through the pipe the water overflowing from the raiser, through which the scraper finally emerges, is much discolored and not infrequently has a very offensive odor. Just how much effect the impurities that produce this odor have in contaminating pure water coming into the pipes is difficult to say. But it is not impossible that the effect of dirty pipes on the water may be greater than is commonly supposed.

The loss in carrying capacity due to incrustations on the water mains is a matter easily susceptible of measurement, and the increased capacity after cleaning has been proved over and over again. In Brooklyn, N. Y., where some seventy miles were cleaned in 1909, Commissioner John H. O'Brien reported on September 10 that so far as the work had progressed there had been an average of about 50 per cent of increase in the pressure, restoring to some districts where the supply of water had been insufficient for years an ample supply, and increasing also the efficiency of the hydrants connected with the smaller mains. In some cases corrosion and vegetable growth in the pipes had clogged them to such an extent that the stream of water passing through them was not heavier than an ordinary house service pipe. The following account of a test of an 8-inch main before and after cleaning was made in Brooklyn in connection with the same work:

"The section of 8-inch main cleaned, on which the test was made, was 184 feet long and was tuberculated for a height of from one to two inches. The main was laid in 1857, was not coated, and had never been cleaned before.

"The main was cut at Willoughby avenue and was carried to the street surface with bends and straight pipe. A 6-inch Trident meter was attached to the end of the pipe, through which the main discharged. The main was fed at De Kalb avenue through a new 20-inch main.

"To determine the loss of head pressure, gages were attached to two hydrants on the 8-inch main, located 680 feet apart.

"The distance from the meter to the nearest gauge was 100 feet. This gauge was 13.4 feet lower than the other gauge.

"Before cleaning the pressures as indicated by the two gauges were 24½ and 3½ pounds, equivalent to piezometric heights of 70 and 8 feet, allowing for the difference of 13.4 feet in the elevation. The loss in head in 680 feet was therefore 62 feet, or 91 feet per 1,000 feet. The discharge registered by the meter was at the average rate of 0.77 cubic feet per second. A 4-inch smooth pipe with the same loss of head will discharge an equal quantity.

"After the main was cleaned, pressure and meter readings were again taken. Pressures of 11¼ and 21½ pounds were indicated, equivalent to piezometric heights of 26 and 63 feet, allowing for differences in elevation of gauges, or a loss in head of 54 feet per 1,000 feet. The discharge registered by the meter was at the average rate of 1.95 cubic feet per second. A 6½-inch smooth pipe with the same loss of head will discharge a like quantity.

"The results of the test indicate that the flow of the 8-inch tuberculated main was increased from that of a 4-inch smooth pipe to the flow of a 6½-inch smooth pipe.

The discharge registered by the meter after the main had been cleaned was 153 per cent greater than the discharge registered before cleaning."

Instances of great increases in capacity of mains can be multiplied by examples from many cities. In Camden, N. J., the capacity of a 4-inch main was increased from a flow of 100 to 227 gallons per minute; the flow of an 8-inch main was increased from 223,000 gallons to 1,060,000 in 24 hours. In Pittsburg increases varying from 64 per per cent to 564 per cent were noted. At Belle Plaine, Ia., a 6-inch main, 5,044 feet long, had been discharging 240 gallons per minute, with a pressure at the pump of 125 pounds. After cleaning, with the pressure reduced to 60 pounds, 335 gallons a minute were discharged.

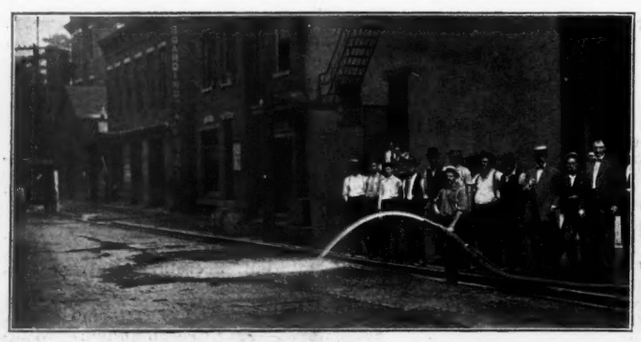
In a paper before the twenty-seventh annual convention of the American Water Works Association, Nicholas S. Hill, Jr., suggested the advisability of equipping pipe systems with manholes for the purpose of test, inspection and cleaning. Hatch boxes of this description have been installed in Louisville, Pittsburg and other places in connection with the work of cleaning the mains. These hatch boxes are simply sections of water mains of about half the circumference of the pipe, provided with flange joints, by which the lid is bolted and leaded to a corresponding section of the pipe. In the case of 4-inch mains the hatch box measures 48 inches over all, in 48-inch mains, 112 inches. These boxes, or part of them at least, should be enclosed in manholes of ordinary construction, with elongated sections at the bottom and covered with an ordinary cast-iron manhole cover at the top.

The various growths that tend to fill water pipes may be classed as follows:

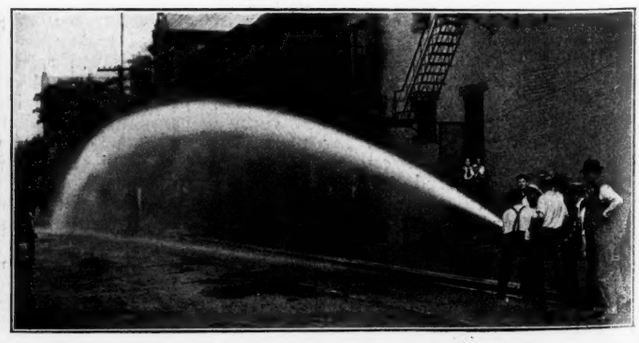
1. Tuberculation, or rust. Incrustations of this sort are formed by the corrosion of iron pipes where the inner surface is not protected, or is imperfectly protected. These incrustations begin as minute projections dotted over the surface in varying number—sometimes in rows, but generally in an irregular manner. In form they resemble small asymmetrical cones or limpets, often with a steep and a more sloping side. They grow by addition in concentric layers. The steep side faces the current. They grow in size and numbers until they ultimately become confluent and form a coating of considerable thickness.

2. Deposits and growths dependent upon the quality of the water. These include incrustations due to alkalinity, and are composed of carbonates of lime and magnesium and sulphide of lime principally. In addition to the deposits due to physical and chemical action these deposits are due to the biological condition of the water. Ferruginous slime is due to organisms belonging to the Crenothrix group. Pipe moss is produced by colonies of minute animals of the bryozoa group. Several species of the group spongidæ may also grow in pipes and tend to clog them up.

3. Sedimentary deposits. These generally occur at low points, or where the current is sluggish. They consist of mud, particles of rock and clay and dead organisms. These deposits may be removed by flushing the mains, but scraping may be necessary.



SIZE OF STREAM BEFORE CLEANING



SIZE OF STREAM AFTER CLEANING

Selection of Centrifugal Pumps

THE diagram of different positions of suction and discharge, showing outer half of pump shell, is published by the Morris Machine Works, Baldwinsville, N. Y., to assist their customers in their selection. Before ordering pump the engineer should determine which position will best suit his requirements as regards rotation of shaft and connection with suction and discharge pipes so as to get the most direct pipes with the least number of elbows or bends. In viewing the diagrams the engineer is supposed to stand at the outer half of pump shell looking over pump towards the pulley or engine, if directly connected. The pump can be swiveled around the frame, so that, for instance, if pump per diagram No. 50 is ordered it can, after receipt, be made Nos. 51, 52 and 53.

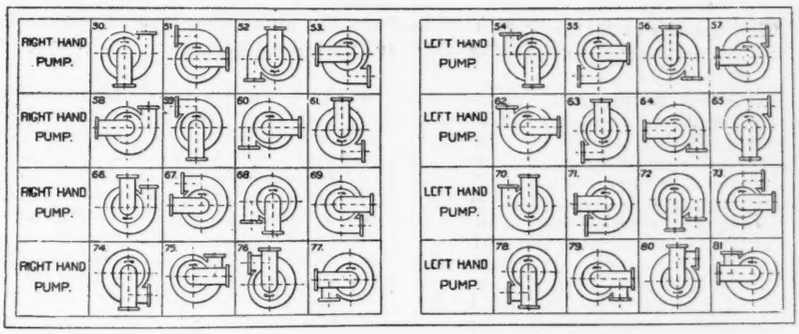
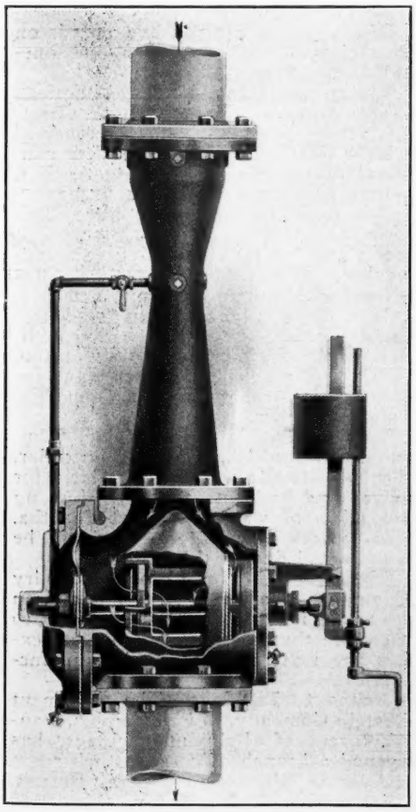


DIAGRAM TO ASSIST CUSTOMER IN SELECTING CENTRIFUGAL PUMP

Simplex Rate Controller

THE Simplex rate controller is designed for service in a water pipe or conduit through which the rate of discharge must be maintained uniform, regardless of the pressure or head on the up or down stream side of the valve. The apparatus consists of a perfectly balanced valve, operated by a diaphragm, a Venturi section or tube, and means whereby the diaphragm is actuated by the difference in pressure between the full and contracted sections of the Venturi tube. The diaphragm and valve are balanced by an adjustable counterweight, which, when set for any required rate of flow, will hold the valve discs in the proper position for that flow. In every well-regulated filter plant, wherein rate controllers are used, it is the invariable custom to also provide for loss-of-head and rate-of-flow gauges. To adjust this controller, it is only necessary to watch the rate-of-flow gauge and move the counterweight so as to produce the rate of flow desired, after which the mechanism will automatically maintain this rate until the counterweight is readjusted. Where rate-of-flow gauges are not used, the graduation on the scale beam can be used for this purpose. They are manufactured by the Simplex Valve and Meter Company, 112 North Broad street, Philadelphia, Pa.



DEVICE TO CONTROL RATE OF FLOW IN WATER PIPE

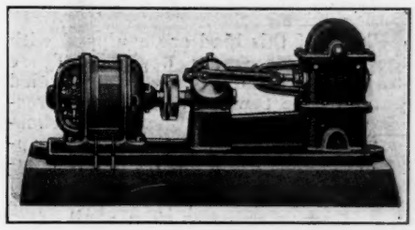
Paul Pumps

THE Paul pump is designed to meet the demand for a high-grade pump, suitable for individual water supply systems. Pump chamber, suction and discharge are arranged to allow a straight flow of water without churning and to avoid air pockets. Immediately below the pump chamber and forming part of the bedplate is a suction air chamber. Above the pump chamber is a discharge air chamber. Both these chambers are of unusually large capacity and make the pump noiseless in action, insuring a steady flow in the pipes. For convenience of installation the pump is tapped for suction on both sides, the discharge being central on top of discharge chamber. The pump cylinder, cast in one with the pump chamber, is lined with special brass and is bored in the same setting in which the chamber is faced, insuring accurate alignment of moving parts. The piston, of phosphor bronze, is provided with packing rings, making a tight fit with the least amount of friction. It is held against a shoulder of the piston rod by means of a nut and check-nut. The piston rod is of Tobin bronze. The suction and discharge valve seats, of brass, are screwed into the pump chamber. The valves, of a special composition, are ground tight and held against their seats by phosphor bronze springs. The valve area is very liberal. The gland for the piston rod is also of a special composition and a deep stuffing box allows the rod to be packed without jamming. The guide is provided with a steel bushing through which the piston rod passes. Two bronze-bushed connecting rods, with adjustment for wear, transmit the motion from reducing gear to crosshead, making all stresses central, overhung pins and similar weaknesses being wholly eliminated. The reducing gear consists of a double-threaded worm and gear, both accurately machine-cut and running in oil. The end thrust of the worm is taken up by a perfect ball-bearing with hardened steel races. The coupling between motor and reducing gear is isolating and flexible, the power being transmitted by a renewable leather belt. It also furnishes the necessary flywheel effect. The electric motors used with these pumps have specially treated moistureproof coils and insulation and are furnished for any kind of current. The pump complete is mounted on a common, rigid cast-iron bedplate, making the machine self-contained.

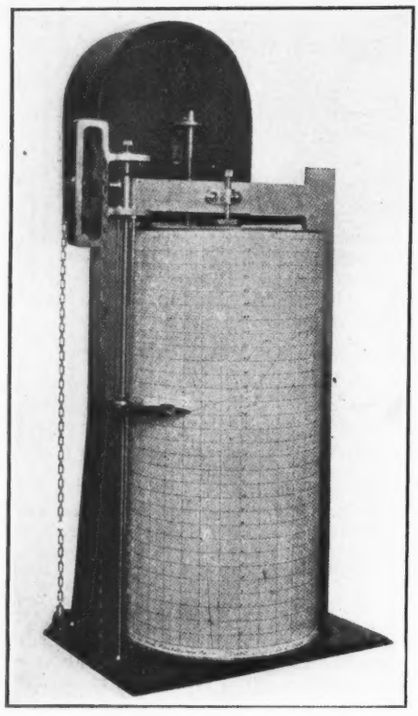
The Paul pump is manufactured by the Fort Wayne Engineering and Manufacturing Co., Fort Wayne, Ind.

Hydrographic Chronograph

THE hydrographic chronograph gives a complete graphic record of the varying head of streams, reservoirs or other bodies of water. It is invaluable for use wherever it is desired to secure a record showing the water head at all times, particularly reservoirs and power streams. The instrument is operated by a glass float attached to a brass link chain which passes over the sprocket wheel on the left-hand side of the upper frame (see cut), the other end of this chain being connected to an iron counterweight balancing the dead weight of the float when same is partially immersed in water. As the float rises or falls with the water, the sprocket wheel revolves, thus raising or lowering the recording pen by means of small bevel gears acting on a vertical worm and nut. The drum is revolved by clockwork, the pen tracing a curve on the chart, each point of the curve corresponding to the time as laid off on the chart. The instrument in its case is set on a shelf or platform at a point above the surface of the water. A three-inch iron pipe is set vertically beneath it in which the glass float travels. This pipe must extend from a point below the lowest water line to a point above the highest. Holes are drilled in it below the water line for free admission of water. The base of the instrument can be set at the same level at the top of the three-inch pipe; if higher, the float pipe should be capped and the cap tapped for a three-quarter-inch pipe, which must extend up to the case to enclose the chain. A three-quarter-inch iron counterweight pipe, of the same length as the float pipe, extends down from the instrument to enclose counterweight and chain. In setting the instrument, a quart of kerosene oil should be poured into the float pipe. This will lubricate the float and cause it to work easily,



PAUL CENTRIFUGAL PUMP



RECORDING WATER LEVEL GAUGE

and will also prevent the possibility of ice forming in the float pipe in winter.

This hydrographic chronograph is manufactured by Barrett & Lawrence, Incorporated, 662 Bullitt Building, Philadelphia, Pa.

Ozone Plant for Water Sterilization

STATIONARY ozone installations for water sterilization having a capacity of from 800 to 2,700 gallons are made by Siemens & Halske, Hudson Terminal Building, New York. Such an installation consists of:

A sterilizing tower of the well-known Scrub constructions filled with flint stones. The air passes upward through the tower, thus coming into contact with the water at it trickles down.

An installation of a direct current motor driving, by direct coupling, an alternating current generator and at the same time, by means of belt or chain-gearing, an air blower and water pump.

A wall bracket, on which stand two Siemens Type ozone cabinets, each with 8 ozone elements (underground inner poles, consisting of aluminum cylinders and outer poles consisting of glass cylinders, immersed in cooling water)—the type so well known in the literature of ozone. This same bracket also carries in addition to an electrical measuring instrument and switch for the primary circuit of the transformer, the transformer itself, and

A switchboard with cut-out, voltmeter, and fuses and underneath these a rheostat for the electric motor and resistance for the exciter of the alternating current machine. The arrow in the illustration indicates the direction of flow of the air and of the water in the ozone apparatus and tower.

Plants of this kind are equipped with the electrical safety devices. These devices stop the supply of unpurified water to the tower whenever the pressure of the current in the transformer attached to the ozone apparatus should diminish or fail completely or whenever the current of ozonized air passing through the ozone apparatus and the sterilizing tower should diminish or fail completely.

TRADE NOTES

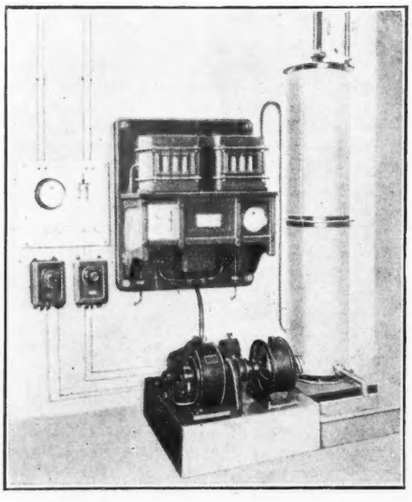
Cast-Iron Pipe.—Chicago: Railroads are active buyers of culvert pipe and the jobbing business is good. Birmingham: Cast-iron pipe plants of the district are running full, and all report sufficient orders in hand to guarantee continued operations for some time. Quotations: 4 to 6-inch, $25; 8 to 12-inch, $24; over 12-in, average, $23. New York: While the volume of business is far better than at the corresponding time last year, it is considerably under previous years. Quotations: 6-inch, $25.50 to $26.

Lead.—Market very quiet and slightly lower. Quotations: New York, 4.35 to 4.40c.; St. Louis, 4.17 to 4.25c.

Artesian Wells.—Probably the largest contract for artesian wells ever let in the State of Texas was made by the Lobo Land and Irrigation Company, of Crockett, with the Dimmick Construction Company, of Kansas City. The contract calls for 500 wells on 60,000 acres of land in El Paso County, known as the Van Horn Valley, which this company is preparing to place on the market. The contract price is regulated by the depth of the wells. Water is found at about 250 feet over the greater part of the property, and in many places much nearer the surface. It is estimated the wells will cost about $400 each, which would make a total cost of $200,000.

Well Construction.—H. W. Clark Company, 118 Broadway, Mattoon, Ill., has placed on the market a device designed to avoid the annoyance and expense encountered by the choking of well strainers and the loss of efficiency caused by the pumping of large quantities of air drawn through the open top of well and passing down into pump chamber. The entire top of well is hermetically sealed, thus permitting by the operation of pump the formation of a vacuum extending to the bottom of the well and greatly increasing the draft or suction on the water bearing stratum. By this equipment, it is claimed, the capacity of wells has been in some cases doubled.

Air Compressors. — The Ingersoll-Rand Company is about to install a complete compressed air equipment for the George W. Jackson Company, of Chicago, for its contract on Section 54 of the Catskill Aqueduct at Yonkers, N. Y. The order covers compressors, drills, mountings and air reheaters.



STANDARD SIEMENS & HALSKE OZONE APPARATUS

Pipe Company Purchases Iron Lands.—The Lynchburg Foundry Co., H. L. McWane, president, has acquired 58,000 acres of iron and timber lands and other valuable property through the organization of the Anniston Iron Corporation, of Anniston, Ala. The officers of the new company are H. E. McWane, president; Ernest Williams, vice-president; Lawrence H. McWane, secretary-treasurer, all of Lynchburg, Va. This company, organized with a capital of $600,000, has purchased the Woodstock Iron and Steel Corporation, including two blast furnaces, with a daily capacity of 150 to 225 tons of iron, and 50,000 acres of iron and timber lands. In acquiring the Woodstock properties the Anniston Iron Corporation also controls the Milner Coal and Railway Co., of Newcastle, Ala., including 8,000 acres of coal land, a mining plant, with a daily output of 1,000 tons of coal, 380 coke ovens and several miles of standard-gauge railway. The Lynchburg Foundry Company already owns and controls the McWane Pipe Works and the Lynchburg Plow Works, Lynchburg, Va., and the Radford Pipe Works, Radford, Va.

Leadite.—The Leadite Company, Inc., Land Title Building, Philadelphia, Pa., furnishes the following statement of the relative quantities of lead and leadite required to make different sized joints:

Diam. of Pipe	Lead per Joint	Leadite per Joint
4 inches	6 lbs.	1½ lbs.
5 "	7½ "	1¾ "
6 "	10 "	2½ "
8 "	12 "	3 "
10 "	15 "	3¾ "
12 "	18 "	4½ "
14 "	22 "	5½ "
16 "	25 "	6 "
18 "	30 "	7½ "
20 "	35 "	8½ "
24 "	45 "	11 "
30 "	60 "	15 "
36 "	80 "	20 "
40 "	90 "	23 "
42 "	100 "	25 "
48 "	120 "	30 "

The above quantities are based on the joints being made two and one-half inches deep.

Water Softening. — The American Water Softener Company, 1011 Chestnut street, Philadelphia, Pa., received a large number of important filter contracts during the year ending April 1, among which are included a 10,000,000-gallon pressure filter plant for Duke's farm, Somerville, N. J.; 1,500,000-gallon plant for the City of South Milwaukee, Wis.; 1,000,000-gallon filter plant for Middletown, Pa.; 1,500,000-gallon pressure filter plant for Merchantville, N. J.; 2,000,000-gallon addition to the filter plant at Wilmington, N. C., and a 1,000,000-gallon plant for the North Strabane Water Company, Canonsburg, Pa.

Valves.—The Western Valve Company, Chicago, Ill., has taken an order, through its Kansas City office, for valves and hydrants to be used along ten miles of water mains at Sabetha, Kan., where new water works will be constructed during the summer.

Pipe.—The Charlotte Pipe & Foundry Company, Charlotte, N. C., has been operating its new plant long enough to ascertain that a very large demand exists for material such as it manufactures.

Belmont Packings.—The Clement Restein Company, of Philadelphia, manufacturers of Belmont packings, has opened a branch office and stock room at No. 11 Woodward avenue, Detroit, Mich., with E. N. Marcy, who was formerly connected with their general office as manager.

PERSONALS

BIRD, HENRY P., Miami City, Ariz., has been elected City Engineer; he was formerly a member of the staff of City Engineer Abram Swan, Jr., of Trenton, N. J., and went West about a year ago for his health.

BOSMAN, DAVID, Mayor of Rutherford, N. J., has made the following reappointments; Borough Clerk, Frank A. Stedman; Counsel, John M. Bell; Engineers, Wise & Watson; Superintendent of Streets and Assessor, Charles L. Crear.

BROWER, DAVID, McKeesport, Pa., has been elected a member of the Board of Water and Lighting Commissioners by City Council, receiving 23 votes to 9 for George B. Herwick, who had held the office a number of years.

CALLAGHAN, BRYAN, Mayor of San Antonio, Tex., was presented with an automobile—an Apperson car of the latest model—by his friends in and out of office on the occasion of his fifty-eighth birthday.

COOKS, THEODORE F., Superintendent of Water Works of Dover, Del., has been re-elected.

COTE, EDMUND, Fall River, Mass., former Alderman, who was recently appointed as a member of the Watuppa Board by Mayor Coughlin, has tendered his resignation, on account of pressure of other business, and Albert J. Brunelle, a druggist, has been named to succeed him.

CREECY, EDMUND P., Chief of Police of St. Louis, Mo., has been dismissed by the Police Board, and Capt. Will Young appointed to succeed him.

CURTIS, BRACY, Nogales, Ariz., has been elected Chief of the Fire Department; Capt. L. W. Mix has been elected Honorary Chief.

DALGADO, ISAAC, New Orleans, La., who recently gave $150,000 for the erection of an art gallery in City Park, has been elected an active member of the Board of Commissioners of the City Park Improvement Association by a *viva voce* vote, succeeding E. J. Reiss, Secretary of the Board, and a charter member, who resigned on account of ill health.

GRAINGER, CHARLES F., Louisville, Ky., has been reelected President of the Water Board. Other members are: Vice-President, Charles F. Huhlein; Chief Engineer and Superintendent, Theodore A. Leisen; Secretary, J. B. Collins; Treasurer, Wilson H. Escott; Chief Assessor and Acting Secretary, J. Baxter Kremer; Assistant Chief Engineer and Superintendent, C. M. Duke; Auditor, John S. Morris; Buyer and Assistant Treasurer, C. S. Potter; Attorney, A. J. Carroll.

GLASER, JOHN, Chief of the Fire Department, Watertown, Wis., has been re-elected; Alexander A. Hardie was chosen Assistant Chief.

HALLMARK, W. F., Dublin, Tex., has been elected Chief of the Fire Department; John Allbright, First, and B. W. Lafferty, Second Assistant Chief, and W. L. Hunt, Secretary.

HERSCHEL, CLEMENS, and Francis L. Pruyn have been retained by the New York Board of Estimate and Apportionment to make a report on the proposed deep-rock pressure tunnel for the distribution of the new Catskill water supply in the Boroughs of Manhattan, Bronx, Queens, Brooklyn and Richmond, and on the steel-pipe lines in the last three boroughs. Prof. J. E. Woodman, professor of geology at New York University, has been retained to pass upon the geological questions involved.

HEINEMAN, DAVID E., Detroit, Mich., President of the League of American Municipalities, has been nominated and confirmed as Comptroller of the city.

MCCARTHY, CAPT. CARLTON, former Mayor of Richmond, Va., has been elected to the new office of State Accountant, and will take office July 1.

MCINTOSH, H. M., Burlington, Vt., has been elected City Engineer; Harold Stevens, Street Commissioner; A. H. Rutter, Water Commissioner.

MCKINNON, ROBERT, City Engineer of York, Pa., has been elected Borough Surveyor of West York.

PARKER, E. R., Houston, Tex., has been named as Fire Marshal by Mayor H. B. Rice, and the insurance key rate will, as a result, be reduced three cents.

PETERS, JAMES, Benson, Neb., has been elected City Engineer.

REDMAN, HENRY, Durango, Col., has been elected Water and Sewer Superintendent by the City Council.

SMITH, N. N., Beaumont, Tex., has been elected Chief of Police.

SHARP, HERSCHELL, Chief of the Fire Department of Bedford, Ind., was instantly killed through grabbing a live electric wire while fighting a fire in a store building.

STANBERY, H. M., Sistersville, W. Va., has been appointed City Engineer.

THOMPSON, CHARLES O., Saugus, Mass., has been appointed Chief of Police.

TITUS, J. H., Arkansas City, Kan., has been appointed City Engineer. Mr. Titus has been Consulting Enginer for the city on sewers and pavements.

UNDERHILL, ARTHUR, Landscape Architect, has opened offices at 103 Park Avenue, New York.

WISE, JAMES H., San Francisco, Cal., has become associated with F. G. Baum & Co., Consulting Engineers, and will have charge of the civil and hydraulic work in connection with water power and irrigation reports and developments.

The following changes in the organization of the Board of Water Supply of New York City have resulted from the resignation of Charles L. Harrison, Deputy Chief Engineer to the Board of Water Supply. Mr. Harrison, who is understood to have withdrawn from the service of the Board, where he was receiving a salary of $12,000, to accept a more remunerative position elsewhere, was appointed on April 12, 1909. He had previously had wide experience in aqueduct work for the city:

Merritt H. Smith, of White Plains, to succeed Mr. Harrison, at $10,000 per annum, is now Department Engineer in charge of the Southern Aqueduct Department, and was appointed April 14, 1906, at $7,000 a year.

Frank E. Winson, White Plains, senior Division Engineer, at $4,500, has been appointed Department Engineer to take charge of work on the Southern Aqueduct at $7,000.

William W. Peabody, White Plains, appointed Division Engineer, succeeds Mr. Winson at a salary of $4,500.

Ernest W. Clarke, Babylon, Assistant Engineer, has had his salary increased from $2,700 to $4,000, and has been promoted to Division Engineer, White Plains division.

Alexander E. Kastl, Peekskill, has been promoted from Assistant Engineer to Division Engineer, with an increase of salary from $2,400 to $4,000.

Frank L. Jones, 161 West 97th st., Assistant Engineer, received an increase from $1,800 to $2,000.

William D. Murray, of White Plains, Assistant Engineer, received an increase from $1,350 to $2,000.

James F. Sanborn, Peekskill, has been appointed Division Engineer Wallkill Division, Northern Aqueduct Department, succeeding Lawrence C. Brink, resigned.

Irving J. Brown, New York, has been appointed structural steel draftsman of the Board of Water Supply.

MAYORS NEWLY ELECTED

Tuscaloosa, Ala.—Ziruri Shirley, Mayor; W. E. Bingham, President of Council.
Santa Rosa, Cal.—James R. Edwards over E. Bernhardt.
Hartford, Conn.—Edward L. Smith over Mayor Edward W. Hooker.
New Britain, Conn.—Alderman John M. Holloran over Orson F. Curtis.
Palatka, Fla.—H. A. Davis, re-elected.
Tabor, Ia.—W. H. Wyant.
Hagerstown, Md.—Thomas Gilleece.
Middletown, Md.—George L. Doub.
Alba, Mo.—W. A. Farmer.
Farnell, Mo.—E. B. Hubbard.
Helena, Mont.—F. J. Edwards.
Carlsbad, N. M.—C. H. McLenathen.
Santa Fé, N. M.—Arthur S. Seligman.
Roswell, N. M.—George Veal.
Fargo, N. D.—V. R. Lovell.
Tulsa, Okla.—L. J. Martin.
Myrtle Creek, Ore.—Robert A. Priston.
Jonesboro, Tenn.—Dr. N. N. Warlick.
Tacoma, Wash.—A. V. Fawcett, first commission Mayor.
Guyandotte, W. Va.—O. H. Wells, re-elected, over W. C. Dusenberry.
Morgantown, W. Va.—Edward Donley over Al Layton.
Rowlesburg, W. Va.—G. H. Wheeler over E. V. Henderson.

Michigan Mayors

Bad Axe—W. H. Lankjin.
Flint—Guy W. Selby.
Owosso—W. D. Burke.
Muskegon—H. E. Reitdyk.
Kalmazoo—Charles Farrell.
Ionia—Harvey E. Kidder.
Ludington—Wm. Rath.
Ypsilanti—Percy L. Towner.
Allegan—Dr. C. W. Young.
Midland—S. B. Gordon.
Marshall—Ernest D. Fawey.
Hancock—Frank James.
Corunna—A. E. Richards.
Belding—W. F. Sardell.
Alma—Dr. C. F. McClinton.
St. Louis—E. C. Phillips.
Traverse City—Emanuel Wilhelm.
Cheboygan—F. E. Brackett.
Mason—John N. Thornburn.
Stanton—M. W. Stevenson.
Mackinac Island—W. D. Chalmers.
Standish—W. N. Pomeroy.
Cadillac—F. O. Gaffney.
McBain—C. R. Burleson.
East Tawas—Jas. LaBerge.
Tawas City—M. Wuggazar.
Oscoda—George Sutherland.
Charlevoix—W. E. Hampton.
West Branch—R. C. McKay.
Petoskey—Dr. J. J. Reycraft.
Eaton Rapids—Bert Littell.
Yale—David L. Treat.
St. Clair—Theodore F. Ruff.
Alpena—L. G. Dafoe.
Menominee—H. T. Emerson.
Monroe—Jacob Martin.
Mt. Clemens—Paul Ulrich.
Harrisville—George Rubon.
Brown City—Herman Ruby.
Big Rapids—H. I. Drescher.
Manistee—W. E. Brown.
Clare—A. E. Mulder.

Nebraska Mayors

Albion—W. A. Hosford.
Alma—R. L. Keester.
Alliance—F. W. Harris.
Arapahoe—C. S. Fuller.
Ashland—J. B. Russell.
Blair—W. R. Williams.
Benson—Charles A. Tracy, re-elected.
Broken Bow—Dan Rockwell, relected; no opposition.
Central City—G. E. Schiller.
Creighton—C. C. Johnson.
Chadron—James W. Finnegan, re-elected, third term.
David City—Thos. Wolf over A. M. Walling.
Franklin—T. L. Wood.
Friend—C. H. Justice over John Scheidt.
Fullerton—K. C. Knudson.
Florence—F. S. Tucker, re-elected.
Gothenburg—J. Winchell.
Havelock—Hinkle.
Hartington—Anton Walz over E. A. Ferguson.
Holdrege—McConoughey.
Lexington—S. C. Mullen.
Madison—W. L. Dowling, Jr.
McCook—E. P. Huber.
Minden—H. P. Anderson.
Neligh—W. T. Wattles.
Osceola—H. J. McBeth.
Ord—J. H. Carson.
Oakland—A. Hammerstrom.
Pawnee City—Reuben Lipp, without opposition.
Pierce—Daniel Duff.
Stanton—John Schindler.
Schuyler—Otto Zeolow.
Seward—George Merriam, third term.
St. Paul—H. B. Paul.
South Omaha—P. J. Trainor.
Tecumseh—H. J. Enders.
Tekamah—C. O. Harrington.
Wayne—John T. Bressler.
Wahoo—J. C. Hamilton.
West Point—F. D. Sharrar.

THE WEEK'S CONTRACT NEWS

Relating to Municipal and Public Work—Street Improvements—Paving, Road Making, Cleaning and Sprinkling—Sewerage Water Supply and Public Lighting—Fire Equipment and Supplies—Bridges and Street Railways—Sanitation, Garbage and Waste Disposal—Police, Parks and Miscellaneous—Proposals and Awards

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we can not guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also corrections of any errors discovered.

BIDS ASKED FOR

State	City	Received Until	Nature of Work	Address Inquiries to
			STREET IMPROVEMENTS	
New Hampshire	Concord	April 22	Bldg. 4 miles natur. stone road in Swanzey; 8,000 ft. Hookset.	H. C. Hill, State Engineer.
Ohio	Cincinnati	April 22, noon	Improving Symmestown road, Symmes twp.; Sec. No. 973	Fred Dreihs, County Clerk.
Pennsylvania	Lansdowne	April 22, 8 p.m	Paving portions of Baltimore ave. with asphalt or other material	John W. Davis, Sec'y Boro'gh C'ncil.
Indiana	Marion	April 23; 1 p.m	Bldg. Grant and Wabash County line gravel road	Grant County Commissioners.
Indiana	Terre Haute	April 23, 11 a.m	Constructing gravel roads	N. G. Wallace, County Auditor.
New York	Buffalo	April 23	Repaving 3 sts.; paving Mississippi st	F. G. Ward, Comr. of Public Works
California	Sacramento	April 25	Asphalt pavement on 10th st., from N to T sts	M. J. Desmond, City Clerk.
Arizona	Phoenix	April 25	Bldg. 13 miles territorial highway between Prescott and Phœnix	Robt. A. Craig, Sec'y State Bd. Con'l.
California	Ft. Rosencrans	April 25	Bldg. 3 miles road, including gutters, culverts, etc	Lt. C. A. Lohr, Constr. Q. M.
Pennsylvania	Oil City	April 25, 7:30 p.m.	Brick paving, 26,000 sq. yds.; curbing, 17,000 lin. ft.; excav., 15,000 cu. yds.; sidewalks, 29,000 sq. ft.; retaining walls, 700 cu. yds.; concrete conduit, 4x4 2-3 ft., 2,000 ft. long	C. W. Mullalley, City Comptroller.
Florida	Lake City	April 25	Constructing 5 miles of cement sidewalks	J. C. Sheffield, Chm. Bd. Bond Trus.
Ohio	Columbus	April 25	Improving Henderson road, 24,000 lin. ft. to Perry twp. line	Hugh Lindsay, County Surveyor.
Ohio	Xenia	April 25	Macadamizing 2 miles Jamestown-Bowersville pike	A. G. Carpenter, Pres. Co. Comrs.
Saskatchewan	Yorkton	April 25	Concrete sidewalks, 80,000 sq. ft.; material and labor	F. P. McArthur, Town Engineer.
Florida	Palatka	April 26	Bldg. 10 miles of hard-surfaced road to Bostwick	R. F. Ensey, County Engineer.
South Dakota	Sioux Falls	April 26	Paving with Sioux Falls Jasper blocks on 6-in. concrete, 6th st.	Lewis Larson, City Auditor.
Minnesota	Reg Wing	April 27	Paving 10,000 sq. yds. Broad and Lever sts.; A. E. Rhame, C. E.	E. C. Erb, Pres. Bd. Pub. Wks.
New York	Brooklyn	April 27, 11 a.m	Regulating, grading, curbing and laying sidewalks	Alfred E. Steers, Boro. President.
Alabama	Attalla	April 27, noon	Artificial stone sidewalk 5,100 sq. yds.; combined curb and gutter, 7,800 lin. ft.; Hill & Campbell, Engrs., Gadsden	Town Council.
Massachusetts	New Bedford	April 27	Block paving, 13,930 sq. yds., 7 sections of st., also grano. walks.	Chas. F. Lawton, Supt. of Sts.
New Jersey	Jersey City	April 27, 10:30 a.m.	Excav. gravel center of Hudson blvd. in W. Hoboken and No. Bergen twp., and repaving with Telford and rein. present macadam pvmt., all to have tar or asphalt binder; also rein. curbs, repaving gutters with brick or concrete, instead of Belgian block, bldg. new receiving basins and sewers	J. C. Sweeney, Clk. Co. Blvd. Comrs.
Iowa	Ft. Des Moines	April 28, 3 p.m	Resurfacing 44,000 sq. yds. macadam roads	Constructing Q. M.
Nebraska	Kearney	April 28	Constructing 5 1-2 miles of roads	J. H. Dean, County Clerk.
Virginia	Norfolk	April 29, noon	Regulating and paving with smooth material 20,000 sq. yds.	W. T. Brooks, City Engineer.
New Hampshire	Concord	April 29, 1 p.m	Constructing one mile of Bethlehem stone road	H. C. Hill, State Engineer.
Ohio	Cincinnati	April 29, noon	Imp. No. Bend and Burnt School House roads, Green twp	Fred Dreihs, Clk. Co. Comrs.
Connecticut	New Haven	April 30, 2 p.m	Wood block paving, 5 sts.; granite, 2 sts.; bit. macadam, 1 st.	C. W. Kelly, City Engineer
Ohio	Cleveland	April 30, 11 a.m	Paving bridge approaches over Belt Line R.R., Bkln., & Hts twps	Frank R. Lander, County Surveyor.
California	San Jose	May 2	Rock cut, embankment and concrete revetment; cost $13,000.	J. G. McMillan, County Surveyor.
Indiana	Mishawaka	May 2	Paving 4,750 sq. yds., any hard material, on 5-in. concrete base, Mill st	J. W. Haverly, City Engineer.
Indiana	Danville	May 2, 10 a.m	Bldg. 2 gravel roads 2,000 ft. and 10,606 ft. long	W. H. Nichols, County Auditor.
Indiana	Crown Point	May 2, noon	Constructing 3 gravel roads in North Township	C. A. Johnson, County Auditor.
Indiana	Greencastle	May 2	Constructing 9,165 ft. gravel road in Jackson twp	D. V. Moffett, County Auditor.
Texas	Sherman	May 2	Paving, any material, 21,650 sq. yds.; curb, 8,432 lin. ft.	Barney C. Kreager, City Secretary.
Pennsylvania	Mechanicsburg	May 2, noon	Paving Main st with any suitable material; 23,300 sq. yds. paving, 10,000 ft. concrete curb, exc. of st. ry. area; C. A. Bingham, Carlisle, Engr.	S. E. Baschore, Sec'y of Council.
Florida	Jacksonville	May 2, 3 p.m	Laying sidewalks on 9 or more sts. Philip Prioleau, City Engr.	P. A. Dignan, Bd. Pub. Wks.
Montana	Havre	May 2, 8 p.m	Grading and boulevarding and constructing 37,900 sq. ft. cement walks, 5 Improvement Dists.; S. L. Hanley, City Engr.	James Holland, City Clerk.
Ohio	Weston	May 2, noon	Brick or block paving, etc., Taylor st., from Main st. to Otsego Pike ditch	H. E. Jones, Village Clerk.
Indiana	Marion	May 3	Bldg. L. M. Cole stone road, 2 miles; also John W. Keever road.	Board of County Commissioners.
Indiana	Wabash	May 3, 10 a.m	Constructing 4 gravel and 2 macadam roads in Waltz twp	T. P. Noftzger, County Auditor.
Indiana	Vincennes	May 3, 2 p.m	Bldg. 3 gravel roads: 8,140, 8,050 and 9,383 ft. long	John T. Scott, County Auditor.
Indiana	Anderson	May 3	Bldg. brick road, Anderson twp., 5,403 ft. long	E. P. McMahon, Chm. Co. Comrs.
Indiana	Kokomo	May 3, 2 p.m	Bldg. Frank Jackson and Ephriam Miller gravel roads, 3 mi. each	A. B. Easterling, County Auditor.
Washington	Wenatchee	May 3, 5 p.m	Grading, 6,400 lin. ft., paving, curb, etc., Mission st	Sam. K. Sumner, City Clerk.
Missouri	Sikeston	May 3, 7 p.m	Macadamizing one mile Benton and Sikeston road	M. S. Murray, Engineer.
New York	Dunkirk	May 3	Paving or macadamizing and grading 9,560 sq. yds., 2 sts.	R. H. Heppell, City Clerk.
Oklahoma	Clinton	May 3, 8 p.m	Asphalt paving, 67,000 sq. yds. on 5-in. concrete base, grading storm sewers, etc.; 20,000 ft. concrete curb and gutter; 5,000 ft. concrete curb, 5,000 ft. concrete gutter	J. L. O'Hearn, City Engineer.
Indiana	Greencastle	May 5, 11 a.m	Constructing M. E. Stewart gravel road, 2 townships	Commissioners of Putnam County
Minnesota	Duluth	May 5	Improving Vermilion road to Whiteface river	E. G. Krahmer, County Auditor.
Ohio	Steubenville	May 9, noon	Grading, sewering, macadamizing Bloom-Weston tpk	Jefferson County Commissioners.
Ohio	Columbus	May 10	Furn. and placing limestone screenings on Hess Pike	H. K. Lindsey, County Surveyor.
Ohio	Columbus	May 11	Grading and macadamizing 2 roads, 3,705 and 7,420 ft. long	John Scott, Chm. Co. Comrs.
Indiana	Jefferson	May 23, 11 a.m	Bldg. 26,489 ft. crushed stone, road in 3 counties	Peter Nachand, County Auditor.
California	Long Beach	May 30	Paving Railway, American and Appleton streets	Board of Public Works.
			SEWERAGE	
Alberta	Calgary	April 22, 4 p.m	Furn. salt-glazed vit. clay sewer pipe, f. o. b. Calgary; also for 5 miles of sewers and 3 miles of water mains, city supply pipe.	H. E. Gillis, City Clerk.
Washington	Seattle	April 22, 10 a.m	Bldg. Lake Washington Dist. of North trunk sewer	C. B. Bagley, Sec'y Bd. Pub. Wks.
New Jersey	Chatham	April 23, 3 p.m	Bldg. 7 miles 8 to 15-in. vit. pipe sewers, Y branches, manholes, flush tanks, etc. Clyde Potts, 30 Church st., N. Y. City, Engr.	Frank L. Kelly, Mayor.
New York	New York	April 23, 11 a.m	Labor and material for repairs to sewer in 110th st	George McAneny, Pres. Boro. Man'n.
Ohio	Lorain	April 23, noon	Constructing sewers: So. Bwy. sub-main, 5 sts.; W 21st. st. sewer	L. B. Johnston, Clk. Bd. Pub. Serv
New York	Fultonville	April 25	Constructing sewer system	W. H. Turnbull, Village Clerk.
Nebraska	Alliance	April 25	Bldg. lateral sanitary sewers, 8 dists., 9,476 lin. ft.; cost, $8,090.	Grant & Leton, Lincoln, Engineers.
Arkansas	Stuttgart	April 25	Bldg. 1,400 ft. 15-in., 1,546 ft. 12-in., 4,945 ft. 10-in., 19,666 ft. 8-in., 4,360 ft. 6-in. tile pipe sewers, 118 manholes, 10 flush tanks; also bldg. sewage purification works equipped with tank and electric ejectors, appliances, connections, etc.; W. S. Shields Co., Hartford Bldg., Chicago, Ill., Cons. Engrs.	Robt. Conn., Pres. Bd. Pub. Impv't.
West Virginia	Huntington	April 25, 1 p.m	Bldg. 12-in. lateral sewer between Wash. and Va. aves., 12th to 14th streets	John Coon, Com'r Sts. and Sewers.
Oregon	Klamath Falls	April 25, 8 p.m	Bldg. 16,700 ft. 6 to 14-in. vit. or cement pipe sewer; sep. bids and as whole for sewer pipe, septic tank, manhole covers, etc.	Don J. Zumwalt, City Engineer.
Kansas	Leavenworth	April 26, 5 p.m	Bldg. $24,000 trunk system in Dist. 9, 19 laterals, cost, $24,765.	J. H. Kirmeyer, City Clerk.
Pennsylvania	Pottsville	April 26, noon	Preliminary plans for Insane Asylum and sewage disposal plant.	Chas. T. Straughn, County Contl'r.
Virginia	Roanoke	April 26, noon	Bldg. 24-in. sewer drain in Luck ave	F. L. Gibboney, City Engineer.

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			SEWERAGE—Continued	
New York	Binghamton	April 27, 4 p.m.	Constructing sewers in 8 streets	John A. Giles, City Engineer.
Kansas	Atchison	April 27, 5 p.m.	Bldg. comb. storm and sanitary sewer in Dist. N: 1,170 ft. 60-in., 15,695 ft. 8-in. tile sewer, etc.; 1,015 ft. 60 and 56-in. culverts	S. K. McCrary, City Engineer.
Ohio	Cincinnati	April 27, noon.	Constructing main sewers and drains, etc., in ravine and streets.	Chief Engr., Dept. of Public Service.
Arkansas	Newport	April 27, 2 p.m.	Bldg. 6 1-2 miles sanitary sewers and pump station. Lund & Hill, Little Rock, Engrs	C. S. Henry, City Secretary.
Saskatchewan	Weyburn	April 27, 8 p.m.	Sewer pipe, disposal works, laying pipe; water works, etc.	Willis Chipman, C.E., Toronto, Ont.
North Dakota	Fargo	April 28, 5 p.m.	Bldg. 12-in. sewer in Thirteenth st., North	F. C. Morgan, City Auditor.
Kentucky	Louisville	April 29, noon.	Contract 66: 2,350 ft. 45, 39, 30 and 12-in. sewer, 9 to 27 ft. cut, 400 cu. yds. concrete; Contract 67: 2,960 ft. 36-in. concrete sewer, cut, 9.4 ft.; 50 cu. yds. rock; 860 cu. yds. concrete	P. L. Atherton, Chm. Sewer Bd.
Illinois	Danville	May 1	Constructing sewer in 2 additions; cost, $70,000	Walter E. Winn, City Engineer.
Iowa	Hawarden	May 2	Bldg. $20,000 sewer system; plans by K. C. Gaynor, Sioux City.	T. J. Reeves, City Clerk.
Georgia	Atlanta	May 2	Bldg. 24,000 ft. trunk sewers, 6x9 ft. to 24-in.	R. M. Clayton, City Engineer.
Kansas	Wichita	May 2, noon.	Bldg. lateral sanitary systems sewer No. 12 in 6 Dists.: 1,513 ft. 21-in., 2,810 ft. 18-in., 3,470 ft. 15-in., 6,797 ft. 12-in., 6,320 ft. 10-in., 113,706 ft. 8-in. vit. pipe sewer, etc.; B. C. Wells, City Engineer	William Senn, City Clerk.
Tennessee	Jackson	May 3, noon.	Sanitary sewer work: 1,530 ft. 16-in. and 192 ft. 6-in. c. i. pipe, leaded joints; 7,744 ft. 6-in. t. c. pipe, 16,428 ft. 8-in., 2,002 ft. 12-in., 3,338 ft. 15-in. double strength; 45 6x15, 45 6x12 and 510 6x8 t. c. Ys, 593 6-in. t. c. bends; 102 brick manholes, special c. i. covers; 8 single and 2 double 8-in. flush tanks	Atwell Thompson, City Engineer.
Kansas	Manhattan	May 3, 3 p.m.	Bldg. complete sanitary sewer system; cost, $80,000, inc.: pumping station, 1,624 ft. 24-in., 5,360 ft. 18-in., 5,200 ft. 15-in., 1,700 ft. 12-in., 67,000 ft. 8-in. pipe; 159 manholes; 23 flush tanks. Con M. Buck, City Engineer	A. W. Long, Mayor.
Washington	Wenatchee	May 3, 5 p.m.	Bldg. pipe sewers: 2,056 ft. 24-in., 1,554 ft. 18-in., 1,773 ft. 15-in., 10,225 ft. 12-in., 16,366 ft. 10-in., 21,456 ft. 8-in., 40,512 ft. 6-in. side connections; 184 brick manholes, 4 1-2 ft.; 8 flush tanks; 74 catch basins, Loc. Imp. Dist. No. 8	Sam R. Sumner, City Clerk.
Maryland	Baltimore	May 4, 11 a.m.	Bldg. Sec. 2 Jones Falls Interc. San. Cont. 50: 10,000 cu. yds. earth excav. in trench, 300 in tunnels; 150 cu. yds. rock excav.; 650 cu. yds. embank.; 370 cu. yds. brick and 4,200 yds. concrete masry.; 145,000 lbs. steel reinforcing; 16,000 lbs. structural steel	J. Barry Mahool, Pres. Bd. Awards.
Kansas	Hays City	May 5, 2 p.m.	Constructing $60,000 sewer system and laterals and septic tank plans by W. K. Palmer Co., Dwight Bldg., Kansas City, Mo.	Mayor and City Council.
Maryland	Baltimore	May 11, 11 a.m.	Furn. and erect. mechanical and electrical equipment for sewage disposal works at Back river	Peter Leary, Jr., Pres. Sewer Comn.
Minnesota	Brainerd	May 16	Bldg. lateral sewer, Dist. No. 1	V. N. Roderick, City Clerk.
Mississippi	Belzoni	May 17, 8 p.m.	Constructing system of house sewers: 3 or 4 miles 8 and 10-in. pipe, with centrifugal pump and motor; W. G. Kirkpatrick, Jackson, Engineer	Mayor and Aldermen.
New Jersey	Perth Amboy	May 21, 8:30 p.m.	Constructing 12-ft. sewer in Baker Place	Geo. M. Adair, Street Comr.
			WATER SUPPLY	
Virginia	Orange	April 22, noon.	Constructing water works for town; material and labor	Frank B. Perry, Mayor.
Massachusetts	Fall River	April 22	Furnishing a 6,000,000-gal. high duty pumping engine	Jas. J. Kirby, Clk. Water Board.
Illinois	Aurora	April 22, 5 p.m.	Drilling and casing deep well, 2,250 ft., 16 in. to 200 ft. depth, finish not less than 8-in. T. D. Stinson, Supt. Water Dept.	Board of Public Works.
Alberta	Calgary	April 22, 4 p.m.	Laying 3 miles water mains and 5 miles sewer; city furnish pipe.	H. E. Gillis, City Clerk.
Massachusetts	Ft. Strong	April 23, 10 a.m.	Remodeling water distributing system at fort	Capt. A. M. Miller, Constr. Q. M.
Indiana	Boonville	April 23	Constructing water works lake and pipe therefrom	Aug. Schrieber, Sec'y W. W. Trus.
Connecticut	Wallingford	April 25, 8 p.m.	Laying 7,080 ft. 8-in., 1,825 ft. 6-in. 350 ft. 4-in. c. i. pipe, etc.	P. J. Leonard, Chm. Water Bd.
Pennsylvania	Pittsburg	April 25	Laying, relaying, raising and lowering c. i. hub and spigot water pipe in Hump Dist., and No. Side and W. End flood dists.	Jos. G. Armstrong, Dir. Pub. Wks.
Oregon	Hood River	April 25, 8 p.m.	Bldg. complete municipal water system in and near city	P. M. Morse, City Engineer.
Minnesota	Albert Lea	April 26	Laying 1,962 ft. 6-in., 952 ft. 4-in. water mains, hydrants, valves.	Wm. Barneck, City Engineer.
Ohio	Hillsboro	April 26, 7 p.m.	Furnishing and placing service pipes to curb	A. E. Miller, Sec'y Trus. Pub. Affrs.
Oklahoma	Sentinel	April 27, 2 p.m.	Steel tower, intern.-comb. engine, triplex pump, pipe, valves, etc	F. Murch, C.E., Clinton.
Saskatchewan	Weyburn	April 27, 8 p.m.	Pump house, machinery, wooden stave pipe, mech. water meter, power house, lay pipes, etc. Willis Chipman, C.E., Toronto, Ont.	George Ross, Sec'y-Treas.
New York	New York	April 28, 11 a.m.	Water mains at Jerome ave. pump sta., Bronx; Cont. 34	Board of Water Supply.
New York	Stapleton, S. I.	April 28, 11 a.m.	Furn. at dock 3,800 tons 36-in. c. i. flex. jointed water pipe	J. A. Bensel, Pres. Bd. Wtr. Sup. N. Y. City.
North Dakota	Grand Forks	May 2	Constructing water main, No. 68, in Seventh ave	W. H. Alexander, City Auditor.
Mississippi	Meridian	May 3	Bldg. 8,500 ft. 24-in. reinforced concrete conduit	Wm. F. Wilcox, Gen. Mgr. Wtr. Com
Louisiana	Breau Bridge	May 3	Furn. 2,200 ft. 8-in. and 12,400 ft. 6-in. c. i. water main, 20 fire hydrants; thirteen 8-in. and ten 6-in. valves; two 200 h.p. boilers; 2 duplex pumps; 75,000-gal. tank and tower, 125 ft. high; 10-in. well. A. C. Jones, Opelousas, Engr.	John Comeau, City Clerk.
Kansas	Colby	May 3, 3 p.m.	Bldg. water works; Burns & McDonnell, K. C., Mo., Engrs.	C. V. Parrott, City Clerk.
New Jersey	Atlantic City	May 3, 2:30 p.m.	Furn. and install. at Absecon pumping station: 150 K. V. A. alt.-current generator, exciter, switchboards and transformers	Louis Kuehnle, Pres. Water Bd.
Tennessee	Johnson City	May 5, 7 p.m.	Constructing a water supply system: 12 miles 18-in. gravity main; 5 miles 6, 8, 10 and 12-in. street mains, hydrants, etc.; 5,000,000-gal. reservoir, lined and covered with concrete	W. M. Dunlap, City Engineer.
Connecticut	Waterbury	May 20	Bldg. $300,000 concrete dam in town of Morris	R. A. Cairns, City Engineer.
Maryland	Leslie	June 1	Bldg. 100,000-gal. clay-lined reservoir, furn. c. i. pipe, etc.	G. A. M. Johnson.
			BRIDGES	
New York	Troy	April 22	Bldg. rein. conc. arch bridge on Mill st. and widening st	Jas. M. Riley, Sec'y Bd. Cont. & Sup
Ohio	Dayton	April 22, noon.	Bldg. skew steel bridge, 50 ft. span, with wooden floor, hand-power, bascule or straight-lift type, over M. & E. canal	J. C. Ely, Dir. of Pub. Service.
Kansas	Willard	April 22, noon.	Bldg. 188-ft. steel span bridge, so. end of bridge over Kan. river.	F. B. Simms, Chm. Co. Comrs., Topeka.
Pennsylvania	Easton	April 22, 10 a.m.	Cleaning, scraping and painting various bridges	Young & Reese, County Engrs.
Ohio	Cleveland	April 23, 11 a.m.	Bldg. 2 concrete culverts, E. Cleveland twp., per Reports 2585 and 2586	J. F. Goldenbogen, Clk. Co. Comrs.
Ohio	Mt. Vernon	April 23, 1 p.m.	Bldg. sub and superstructures of Balcom bridge, College twp.; separate bids	Irwin Young, County Auditor.
Pennsylvania	Washington	April 25, noon.	Bldg. 2 rein. conc. arch bridges, 34x48 ft. and 34x28 ft.; also 40 and 64 ft. span plate girder bridges, brick and concrete floor; 30 ft. I-beam; removing and re-erecting 2 steel bridges.	John H. Moffett, County Controller.
Ohio	Chillicothe	April 25	Bldg. rein. conc. arch bridge over Bull's Run, Colerain twp.	R. D. Alexander, County Auditor.
Ohio	Columbus	April 25	Bldg. bridge over Alum Creek, Mifflin twp.; imp. Sand st. bridge.	Hugh Lindsay, County Surveyor.
Missouri	St. Louis	April 25	Bldg. King's Highway viaduct, 1,860 ft. long, 60 ft. roadway, two 14-ft. walls, 3 main and 12 approach spans; O. W. Childs, City Engineer	W. B. Dryden, Sec'y Bd. Pub. Impts.
Ohio	Newark	April 27, 1 p.m.	Bldg. sub and superstructure of Utica bridge, over North Fork, Washington twp.	Fred S. Cully, County Surveyor.
Ohio	Cincinnati	April 29, noon.	Bldg. rein. concrete protection wall for bridge and road, Delhi twp.	Stanley Struble, Pres. Co. Comrs.
Oklahoma	Oklahoma City	April 30	Furn. material and building 4 steel bridges in County	J. W. Riley, County Clerk.
Mississippi	Monticello	May 2, 2 p.m.	Bldg. steel bridge over Silver Creek on Mt. Carmel road	W. H. Speights, Clk. Co. Supers.
Kansas	Leavenworth	May 2, noon.	Bldg. and repairing six bridges	J. W. Nichaus, County Clerk.
Pennsylvania	York	May 2	General overhauling of 27 iron bridges, inc. 2 coats of paint	County Commissioners.
Texas	Sherman	May 2	Bldg. concrete arch or steel span, conc. abutments, 40x22 ft.	Barney C. Kreager, City Secretary.

BIDS ASKED FOR

State	City	Received Until	Nature of Work	Address Inquiries to
BRIDGES—Continued				
Pennsylvania...	Stroudsburg.....	May 2, 11 a.m.....	Bldg. 2 double-arch stone bridges over creeks, Monroe Co.....	Jos. Overfield, County Clerk.
Oklahoma.....	Buffalo.....	May 2, 1 p.m.....	Bldg. 3 wooden truss bridges on piles, 40 ft. long, 14 ft. roadway.	E. L. Hubbard, County Clerk.
Ohio.....	Batavia.....	May 2, noon.....	Bldg. sub and super over creek, on Xenia road, near Edenton..	J. L. Larkin, County Auditor.
Minnesota.....	Cohasset.....	May 3, 2 p.m.....	Bldg. $5,000 steel and concrete bridge over Mississippi river...	E. W. Windsor, Town Clerk.
Nevada.....	Winnemucca....	May 3.....	Bldg. rein. conc. bridge also 2 rein. conc. culverts over Humb.riv.	R. E. Lonsdale, Clk. Co. Comrs.
West Virginia..	Elkins.....	May 6, 3 p.m.....	Bldg. bridge over Cheat river: rein. concrete, steel with concrete or stone abutments, or steel on abutments in place....	F. A. Rowan, County Clerk.
Illinois.....	No. Chicago.....	May 14, noon.....	Bldg. concrete arch bridge at Naval Training Station.....	Bureau of Navigation, Navy Dept., Washington, D. C.
Michigan.....	Ypsilanti.....	May 16, noon.....	Bldg. 3-arch rein. concrete bridge over Huron river, 225 ft. long, 46 ft. wide, over all.....	S. Damon, City Clerk.
Louisiana.....	Gretna.....	June 1.....	Constructing steel bridge over canal in Jefferson Parish.....	E. M. Hubert, Sec'y Police Jury.
Utah.....	White Rocks....	June 1.....	Bldg. substructure of $18,000 steel bridge at Vintah and Ouray Indian agency. M. J. Patterson Constr. Co., Denver, Colo., has contract for superstructure.....	Com'r Indian Affairs, Wash., D. C.
LIGHTING AND POWER				
Ohio.....	Hamilton.....	April 22, noon.....	Furnishing 500 gas meters, 5 and 10-light, large capacity.....	C. M. Robertson, Clk. Dept. Pub. Ser.
Florida.....	Ft. Barrancas...	April 22, 11 a.m.....	Constructing electric lighting system at Fort.....	Constr. Q. M., U. S. Army.
Nebraska.....	Plainview.....	April 25.....	Bldg. electric light plant and lighting system.....	C. W. Lee, City Clerk.
New York.....	New York.....	April 26, 11 a.m.....	Furnishing four 100 h.p. and one 150 h.p. boilers.....	J. A. Bensel, Pres. Bd. Water Supply.
Virginia.....	Richmond.....	April 26.....	Furn. and erect poles, lamp fixtures, wire, transformers and other necessary material in sts., parks and alleys for approx. 1,000 arc lamps and for lighting public buildings.....	E. D. Richardson, Chm. Com. on Elec.
New York.....	Ft. Terry.....	April 30, 10 a.m.....	Bldg. electric light and power plant and system; also minor alterations and for furn. and install. new boiler in pump. plant.	Capt. F. T. Arnold, Constr. Q. M.
Kansas.....	Colby.....	May 3, 3 p.m.....	Bldg. elec. light plant; Burns & McDonnell, K. C., Mo., Engrs.	Fred A. Wertz, Mayor.
Brit. Columbia.	Prince Rupert..	May 3, noon.....	Boilers, engines, condensers, pumps and piping, electrical apparatus, etc. Jas. Milne, Cons. Engr., Loo Bldg., Vancouver.	Thos. Dunn, Chm. Elec. Lt. Com.
Maryland.....	Baltimore.....	May 11.....	Furn. and erect. elec. and mech. equipment for sewage works.	C. W. Hendrick, Ch. Eng'r. Sew. Com'r
Rhode Island...	Ft. Greble.....	May 11.....	Extending and remodeling underground elec. system.....	Lt. F. H. Phipps, Jr., Constr. Q. M.
MISCELLANEOUS				
Massachusetts..	Boston.....	April 22.....	Furn. 20,000 gals. road oil at Forest Hills R. R. station.....	R. S. Peabody, Chm. Park Comrs.
New York.....	Middletown.....	April 23.....	Erecting City Hall on James st; David H. Canfield, Arch.....	W. D. Stratton, Chm. City Hall Com.
Pennsylvania...	Pittsburg.....	April 25.....	Furn. 250,000 gals. liquid asphalt road oil, any R.R. point in Co.	S. D. Foster, County Road Engr.
Minnesota.....	Duluth.....	April 25.....	Erecting bldg. for disabled fire horses with sanitary stall system.	John McCall, Sec'y Bd. F re Comrs.
Pennsylvania...	Carnegie.....	April 25.....	Collecting and disposal of all garbage for one year from May 1.	G. W. Boden, Chm. Boro. Prop. Com.
Mississippi.....	Greenville.....	April 27.....	Bldg. new levees at Riverton and Shiloh, agg. 900,000 cu. yds.	Bd. Miss. Levee Comrs.
New York.....	Brooklyn.....	April 28, 3 p.m.....	Furn. and setting up 200 stationary seats, Ocean & Eastern Pky.	C. W. Stover, Park Commissioner.
Georgia.....	Atlanta.....	April 29, 5 p.m.....	Bldg. 200-ton crematory or two 100-ton plants.....	G. H. Brandon, Sec'y Bd. Health.
Oklahoma.....	Coalgate.....	April 29.....	Erecting $10,000 County jail.....	Felix Gibson, County Clerk.
Florida.....	Perry.....	May 2, 2 p.m.....	Bldg. new brick jail, complete; $500 check with bids.....	John C. Calhoun, Clk. Co. Comrs.
Kansas.....	Colby.....	May 3, 3 p.m.....	Furnishing 1,000 ft. of 2 1-2 in. hose and 2 hose reels.....	Fred A. Wertz, Mayor.
Indiana.....	Fort Wayne.....	May 5, 10 a.m.....	Bldg. public comfort station under sidewalk at Court House...	G. W. Lindemuth, County Auditor.
Nevada.....	Carson City.....	May 9.....	Furnishing 300 steel cells, with window guards, gratings, cell-door locking and operating devices.....	J. W. LeGate, Clk. St. Bd. Prison Commissioners.
West Virginia...	Elkins.....	May 9, 3 p.m.....	Erecting jail and jailer's residence; B. F. Smith, Arch.....	F. A. Rowan, County Clerk.
North Carolina.	Wentworth.....	May 10, noon.....	Building a jail; Wheeler & Stern, Charlotte, Archs.....	J. T. Holland, Clk. Co. Comrs.
Massachusetts..	Boston.....	May 15.....	Furnishing watering carts, also watering and oiling sts. in 10 districts of city; also for cleaning sts. and sidewalks in 4 districts, to Dec. 1, 1910.....	G. C. Emerson, Supt. of Streets.
Illinois.....	East St. Louis...	May 16, noon.....	Constructing diversion channel for Cahokin creek and necessary levees and embankments, etc., San. Dist.....	Bd. Trus. East Side Levee Dist.

STREET IMPROVEMENTS

Anniston, Ala.—Calhoun County Road and Revenue Commissioners are considering calling election on $500,000 road bonds.

Birmingham, Ala.—Extension of brick pavement on 19th st. is being considered.

Camden, Ala.—Citizens will vote May 2 on $150,000 road bonds.

Selma, Ala.—Dallas County has ordered election May 16 on $250,000 road bonds.

Hot Springs, Ark.—City will soon let contract for paving two streets.—H. H. Houghton, Chairman Board of Public Works.

Napa, Cal.—City Engineer Buckman is preparing specifications for paving Main st. with a preparation of bituminous rock; cost $3,800.

Roseville, Cal.—Board has rejected bid for grading Oak, Taylor and Grant sts.

Grand Junction, Col.—James H. Fisk has completed survey for wagon road from Palisade to Kannah Creek; length 12 miles.

Waterbury, Conn.—No bids were received for proposed $100,000 improvement bond issue.

Willimantic, Conn.—Sidewalk Committee has recommended that $3,000 be expended on walks in First District; $1,500 in Second, and $500 in Third.—D. P. Dunn, Mayor.

Jacksonville, Fla.—Committee on Budget is considering $6,000 appropriation for improvements on Highway ave.

St. Augustine, Fla.—St. Johns County Commissioners have adopted ordinances providing for raising of $30,000 to complete two roads.

Atlanta, Ga.—City will pave Ponce de Leon ave. with bitulithic.—H. L. Collier, Commissioner of Public Works.

Macon, Ga.—Street Committee is considering paving on First St.

Marshallville, Ga.—Citizens will vote on bonds for street improvements.

Union City, Ga.—Citizens have voted $20,000 bonds for street and other improvements.—D. A. Carmical, Mayor.

Aurora, Ill.—City will pave State st. with asphalt this summer.

Carlinville, Ill.—City will pave First South st. with brick.

Marion, Ill.—Council has passed ordinance for paving East Main and West Main sts.

Pekin, Ill.—Buena Vista st. will be paved with brick and 6th st. with rubber.—John R. Seibert, Engineer.

Goshen, Ind.—Council has ordered paving of South Main st. at estimated cost of $31,634.

Indianapolis, Ind.—Board of Park Commissioners is considering building of boulevard 100 ft. wide in 38th st.

Michigan City, Ind.—Board of Public Works is considering petition for paving entire length of Baltimore st.

Mishawaka, Ind.—Council has passed four improvement resolutions.—J. W. Haverly, City Engineer.

Richmond, Ind.—Board of Works is considering improvement of Southwest C st. by grading and graveling.

South Bend, Ind.—Board of Public Works has approved resolutions for improvement of about 11 streets.

Terre Haute, Ind.—Plans have been prepared by Engineer Geo. R. Grimes for five miles of crushed stone or gravel road improvements, with concrete culverts, in Fayette and Honey Creek Townships.—N. G. Wallace, County Auditor.

Davenport, Ia.—City will construct 15,540 ft. of brick, asphalt and concrete paving in 22 streets.—Thomas Murray, City Engineer.

Des Moines, Ia.—Council has decided to curb 4th st. with Portland cement curbing and pave E. 9th st. with sheet asphalt.—J. R. Hanna, Mayor.

Glenwood, Ia.—City will pave portions of four streets with brick.—Seth Dean, City Engineer.

Marshalltown, Ia.—Council has passed resolutions of necessity for paving about 19,400 sq. yds. of concrete pavement, 10,500 lin. ft. of curbing, 42,200 sq. yds. of brick block pavement and 23,100 lin. ft. of curbing.—W. H. Steiner, City Engineer.

Arkansas City, Kan.—Cowley County is planning to construct road between Winfield and this city, distance 14 miles. Address Mayor Hess.

Fort Scott, Kan.—Board of County Commissioners has passed resolution providing for extension of good roads from end of the paving on Horton st. to good roads a mile south.

Hutchinson, Kan.—Reno County will expend $20,000 for good roads.—W. B. Harris, County Engineer.

Leavenworth, Kan.—Board of City Commissioners has decided to issue $6,279.05 special improvement bonds for regrading and paving of 7th st.

Pittsburg, Kan.—City is considering paving of three streets with two-course brick.—L. E. Curfman, City Engineer.

Bellevue, Ky.—City is considering reconstruction of Fairfield ave.

Owensboro, Ky.—Appropriation for construction of new rock roads amounting to more than $32,000 have been made by the Fiscal Court.

Paducah, Ky.—General Council has passed resolution to construct 22 miles of concrete sidewalks this year at estimated cost of $175,000.

Paris, Ky.—Bourbon Fiscal Court has rejected all bids for repairs to turnpikes.—C. F. Redmon, Road Supervisor.

Winchester, Ky.—Clark Fiscal Court has decided to purchase road rollers.

Rayville, La.—City is considering issuance of $20,000 improvement bonds for paving and other improvements.

Waterville, Me.—Committee on Streets and Sewers has recommended that $1,000 be appropriated for State roads.

Cumberland, Md.—Governor Crothers has signed bill providing $40,000 bond issue for Allegany County roads.

Frederick, Md.—Governor Crothers has signed bill providing bond issue for improvement of streets.

Frostburg, Md.—Citizens defeated proposed $50,000 paving bond issue.

Oxford, Md.—Governor Crothers has signed bill providing for improved streets.

Fall River, Mass.—New bids will be called for laying granolithic sidewalks.

Fall River, Mass.—Highway Committee will lay 17,200 ft. of curbing during year.

Cheboygan, Mich.—City will construct about 10,000 yds. of tar macadam paving.—W. R. Fenwick, City Engineer.

Detroit, Mich.—Council directed Department of Public Works to advertise for pro-

posals for paving Hillger ave. with cedar blocks, cost $5,934; Iroquois ave., $5,327; Waterloo st., $2,985.—J. J. Haarer, Commissioner.

Grand Rapids, Mich.—Aldermen have authorized street improvements on five-year plan amounting to $309,130.

Hancock, Mich.—Board of Public Works will at once sell $16,000 sidewalk extension bonds.

Holland, Mich.—Department of Public Works is considering paving of W. 8th st.—H. A. Naberhius, City Engineer.

Scottville, Mich.—Citizens have voted $10,000 bonds for paving Main st.—R. W. Trucks, City Clerk.

Duluth, Minn.—City Engineer has estimated cost of paving as follows: E. 4th st. with granitoid, $72,212; asphalt, $79,565; creosote block, $95,196, and with tar macadam, $74,183; same street, from 23d to 27th aves., with granitoid, $39,644; tar macadam, $39,175; creosote blocks, $45,231, and asphalt, $39,945.

Virginia, Minn.—Council is considering paving of Central ave. with bitulithic.—A. E. Beckford, City Clerk.

Collins, Miss.—City will lay sidewalks on Main st.

Carthage, Mo.—City did not receive any bids for grading and macadamizing three streets, approximately 3,000 ft.—F. B. Newton, City Engineer.

Clinton, Mo.—City has decided to construct 1,770 lin. ft. of brick paving.—H. W. Kibbey, City Engineer.

Kansas City, Mo.—Citizens have voted $50,000 bonds for paving repair plant.

Kansas City, Mo.—Councils have passed ordinance to widen Main st.

Kirksville, Mo.—City has decided to pave five streets with brick.—Benjamin Crabtree, City Engineer.

St. Louis, Mo.—Bids will be received by Board of Public Improvements after April 25 for paving with creosote blocks Olive st.—W. B. Dryden, Secretary.

Springfield, Mo.—City will pave Jefferson st. with Hassam.

Webb City, Mo.—City has decided to pave six streets with oiled macadam.—A. J. McKenzie, City Engineer.

Atlantic City, N. J.—Council has passed on final reading ordinance providing for paving of Bartlett and other streets near Gardner's Canal.

Camden, N. J.—Camden County Board of Freeholders has sold $67,000 road bonds to R. A. Robinson & Co., New York, for $104.34.

Camden, N. J.—Council is considering paving of Locust st. with Belgian blocks on sand foundation.—W. D. Brown, Clerk.

East Orange, N. J.—Roads Committee has decided to recommend to Council that asphalt blocks be used to resurface Main st., and for other street work in city.

Irvington, N. J.—Improvement of Springfield ave. is being urged.

Jersey City, N. J.—Street and Water Board has received petitions for improvement of Van Nostrand and Fairmount aves. and Sheffield st.

Millville, N. J.—City Engineer Roberts has estimated cost of draining E. Main st. at $4,800.

Newark, N. J.—Mayor Haussling has signed ordinance for paving South 16th st. with brick.

Paulsboro, N. J.—Citizens will vote June 7 on $7,000 street improvement bonds.

Phillipsburg, N. J.—City will construct 3,600 sq. yds. of brick and 3,500 lin. ft. of macadam paving.—Robt. R. Howell, City Engineer.

Plainfield, N. J.—City will pave number of streets with macadam.—Andrew J. Gavett, City Engineer.

Rutherford, N. J.—Macadam paving in number of streets is considered.—R. M. Watson, City Engineer.

Salem, N. J.—County Board of Freeholders has adopted resolutions for building of State road through Mannington and Pilesgrove Townships to Woodstown Borough.

Albany, N. Y.—Granite and vit. block paving will be laid in eight streets.—Walter Melius, City Engineer.

Binghamton, N. Y.—State Health Commissioner E. H. Porter has recommended that city adopt general and systematic policy in reference to street improvements.—J. J. Irving, Mayor.

Bronxville, N. Y.—John F. Fairchild, Engineer for Westchester Electric Railway, at suggestion of A. W. Lawrence, of Lawrence Park Realty Co., and Trustee Nims, of Board of Trustees, has presented plans for boulevard which in time may be extended from city line of Mount Vernon to village of White Plains.

Olean, N. Y.—Three streets will be paved with brick.—Geo. J. Ball, City Engineer.

Plattsburg, N. Y.—Council has rejected bids for building 2,000 yds. of granolithic sidewalk; Geo. St. John, lowest bidder, 89 9-10c.

Rome, N. Y.—Cost of paving Floyd ave. has been estimated at $30,253.42 and Stanwix st. at $8,600.16.

Schenectady, N. Y.—Council is considering asphalt paving of River Road and Avenue A.

Syracuse, N. Y.—Board of Aldermen has passed ordinance to pave Harrison st. and grade Thomas and Groton sts.

Syracuse, N. Y.—City Engineer Henry C. Allen has estimated cost of resurfacing N. Salina st. with sheet asphalt or bitulithic pavement at $9,940.

Yonkers, N. Y.—City Engineer Hooper has prepared plans for regrading and repairing Dock st., opening Ridgewood ave. and grading Park ave.; construction of sidewalks on Vineyard ave. is being considered.

Dallas, N. C.—Gaston County Commissioners have decided to complete macadam road from Cherryville to Gastonia; distance 17 miles.

Wadesboro, N. C.—Citizens have voted $10,000 bonds for street improvements.—R. T. Bennett, Jr., Treasurer.

Alliance, O.—City is considering paving portions of nine streets with brick.—A. A. Kotte, City Engineer.

Ashtabula, O.—Council voted to pave intersection of Walnut st. and Ohio ave. with macadam; Carpenter rd. will be graded from Lake st. to the city limits.—F. W. Wagner, City Clerk.

Chillicotne, O.—Council has passed an ordinance for constructing cement sidewalks, curbs and gutters in Arch st.—Wallace D. Yaple, Mayor.

Cincinnati, O.—Cost of improving E. Plum st. with wood block has been estimated at $11,573.20.

Cincinnati, O.—County Engineer has estimated cost of improving Hamilton pike at $9,920; improvement of Mill rd. is being considered.

Cincinnati, O.—City has sold $288,000 street improvement bonds to Atlas National Bank.

Cincinnati, O.—Avondale Improvement Association is urging widening and macadamizing of Maple ave.

Covington, O.—Council has adopted resolution for repair of Madison ave.; also ordered improvement of 9th st.

Delaware, O.—Paving of East William st., from Sandusky to bridge is being considered.

Delaware, O.—Need of road scrapers is being considered.—Geo. S. Irwin, City Engineer.

Mansfield, O.—Plans will be prepared for improving 3d st. by spiking with macadam and oiling same; Foster st. will be improved at cost of $3,000.

Norwood, O.—Citizens will vote May 17 on $50,000 bonds for resurfacing streets.

Springfield, O.—County Commissioners will build 2½ miles of macadam road.

Springfield, O.—Residents of Yellow Springs st. are urging paving of street with asphalt block.—Jacob Klein, Service Director.

Troy, O.—Plans are being prepared by City Engineer H. J. Walker for 3,000 sq. yds. vit. brick paving, with concrete curb, on W. Main st.

Upper Sandusky, O.—Plans and specifications have been prepared for paving of Johnson st.

Youngstown, O.—Council has passed resolution to sidewalk two streets; paving of Wick pl. is being considered.

Hugo, Okla.—City is considering paving business district.

Okmulgee, Okla.—Paving of 7 to 14 blocks with rock asphalt is being considered.—T. J. Embree, City Engineer.

Shawnee, Okla.—City has about $100,000 available for 15 miles of asphalt paving.—P. Stearns, Mayor.

Ashland, Ore.—City will soon call for final bids for nearly two miles of asphalt paving.

Allentown, Pa.—Lehigh County Commissioners have applied to State Highway Department for about six miles of good roads.

Braddock, Pa.—Council has passed on second reading ordinance to pave Pitcairn st.

Carbondale, Pa.—Mayor A. L. Sabin has recommended macadamizing of city streets to connect with proposed county road.

Fogleysville, Pa.—Two miles of State road will be constructed from Pleasant View to this place.

Harrisburg, Pa.—State will construct about 70 or 80 miles of highway this year; cost $675,000.

Hatboro, Pa.—Councilmen are preparing to resurface streets with bitumen preparation; cost $2,000.

McKeesport, Pa.—Mayor H. S. Arthur has recommended that prior to repaving of 5th ave. all necessary mains and sewers be laid.

McKees Rocks, Pa.—Borough will pave four streets with brick.—Geo. H. McGinness, Borough Engineer.

Reading, Pa.—Council is considering ordinances for paving five streets; also passed bill appropriating $137,500 to Board of Public Works for paving.

Titusville, Pa.—City Engineer H. A. Holstein has prepared estimates for paving and sewers on several streets.

Charleston, S. C.—City will pave two streets with brick.—J. H. Dingle, City Engineer.

Greenville, S. C.—Citizens have voted $200,000 bonds for street and sidewalk paving and construction of bridge across Reedy River.

Charlotte, Tenn.—Dickson County will vote in August on $100,000 bonds for road construction.

Covington, Tenn.—City will construct about $20,000 worth of crushed rock pavement this year.—J. A. Green, Engineer.

Beaumont, Tex.—City has sold $10,000 street repair bonds to Thos. J. Bolger Co., Chicago.

El Paso, Tex.—El Paso County will construct road from Clint to Fabens, length 7½ miles; excavation, 50,000 cu. yds.—A. S. Eylar, County Judge.

Honey Grove, Tex.—Taxpayers have voted to make permanent street improvements.—S. H. Gardener, Mayor.

Orange, Tex.—Citizens have voted $15,000 street improvement bonds.

San Angelo, Tex.—Citizens have voted Council power to define improvement districts to facilitate paving of streets and construction of sidewalks.—J. D. Hassell, Mayor.

Wylie, Tex.—Wylie Good Roads Association has been organized to obtain graveling of main roads in city.

Kaysville, Utah.—County Commissioners have appropriated $6,000 for improvement of roads in Davis County.

Boykins, Va.—City is considering paving streets.—E. D. Priddy, Mayor.

Petersburg, Va.—Board of Aldermen is considering curbing and guttering of Halifax st. and Union ave.

Colville, Wash.—Council will form four improvement districts for purpose of macadamizing and improving Main st. and a portion of Still st.

Tacoma, Wash.—County Commissioners have appropriated $50,000 towards extension of Center st.

La Crosse, Wis.—La Crosse County will pave principal highways; cost $10,000.

Manitowoc, Wis.—City has decided to pave brick portions of seven streets.—William Rudolph, City Engineer.

Menasha, Wis.—City Engineer Albert McMahon is preparing preliminary plans for concrete pavement to be constructed this summer.

Sheridan, Wyo.—Council has decided upon making paving improvements to extent of more than $300,000.

North Vancouver, B. C., Can.—Citizens have passed two by-laws raising $20,000 and $5,000 for clearing and constructing sidewalks, respectively.

CONTRACTS AWARDED

Waterbury, Conn.—Road work, Columbia blvd., to Edward R. Reilley, city, $7,072; other bidder, Edward McManus, $11,625; Bank st., to Edward B. Reilly, $1,222; other bidders, Edward McManus, $1,688; Michael Testa, $1,925.

Jacksonville, Fla.—Four miles of shell paving of road from South Jacksonville to Mandarin, to Haney & Register.

Decatur, Ind.—Roads: Merryman & Fugate, C. C. Beir rd.; C. C. Musser, Peru, Martz rd.; E. H. Faust, Decatur, Adler rd.; Erie Stone Co., Van Wert, O., Mayley rd.

Michigan City, Ind.—Hermitage ave. pavement, to W. N. Bell & Co., $6,500.

Michigan City, Ind.—Cement sidewalks for year, to J. E. Southard, 67½c. per sq. yd.; grading 25c. per cu. yd.

Muncie, Ind.—Road, to John W. Lambert, Gaston, $3,150.

Vincennes, Ind.—Construction of Abe Hart et al. road, to Abe Hart.

Fort Scott, Kan.—Paving 1st st., to Midland Construction Co., $11,231.55.

Midway, Ky.—Furnishing and spreading rock on the turnpikes of county: Lexington pike, 2,000; Nicholasville, N. D., 1,000; McCracken's, E. D., 1,000; Military, 500, and Mt. Vernon and Pisgah, 1,000, to Gormley Brothers, the last named pike at $1 and the other four at 85c. Midway pipe, 2,000; Spring Station, 400; Lexington and Leestown, 1,500; Woodlake, 800; Midway and Spring Station, 200, to F. D. Redden, $1 for all but the Midway pike, which is 90c. Woodward & McClure were given the Harrodsburg, N. D., 1,000, at $1; Dan Haney, Scott County, 500; Craig's Mill, 300, and Fisher Mill, 100, at $1; L. H. Atkins, McCracken's, W. D., 500, and Jetts, 500, $1; John Myers, Nicholasville, S. D., 200, $1; Allen Jelf, Lexington extension, 200, $1; John Gill, Grier's Creek, 85c., and Dry Ridge, 200, 95c. Other successful bidders were Messrs. E. G. Moore, James Tyson, J. H. Curtis, T. S. Wilson, Arch Britton, R. Darnell and A. J. McGarvey.

Winchester, Ky.—Repairing 14 turnpikes, to Clark County Construction Co., $10,000.

New Orleans, La.—Sidewalks on both

sides of six streets, to C. Hyland & Co., $33,209.

Brookline, Mass.—Sidewalks, driveways during year, to Lowe-Armington Co., 123 Washington st.

Lawrence, Mass.—Furnishing edgestones and flagging for year, to Michael O'Donnell, city.

Eveleth, Minn.—Paving Grant ave., to R. S. Blome Co., Chicago, $189½ per sq. yd.; excavating, 52c. per sq. ft.; resetting brick, 27c. per ft.; curb and gutters, 64c. per ft.

Westford, Miss.—Repairing streets in center of town, to H. W. Tarbell, Lowell, $3,000.

Florence, Neb.—Paving, to M. Ford, by Street Car Co.

Deal, N. J.—Retopping Norwood ave., to Delaware River Quarry and Construction Co., Trenton, 90c. per sq. yd. on trappite; cost about $10,000.

Jersey City, N. J.—Paving Newark turnpike with amiesite, to W. J. Coughlin, $1.24 per sq. yd.

Jersey City, N. J.—Bayonne ave., to Jos. Filon, 93 per cent.; 14th st., to Henry Miller Co., 87 4-10 per cent of standard cost.

Long Branch, N. J.—Laying sidewalks and crosswalks, to Clark & Whalen, 45c. per lin. ft. for street crossings and 18c. per sq. ft. for flagging.

Albany, N. Y.—Batavia rd., to John Miller, Buffalo; other bidders, F. A. Brotsch, Rochester; Mosier & Summers, Buffalo; Geneseo Village, Livingston County, 1.32 miles, to Schroeder-Hicks Contracting Co., Rochester, $16,900; other bidders, McCarty & Siverson, Mt. Morris, $17,193; Fraser & Lowe, Geneseo, $17.769; F. V. C. Bardol, Buffalo, $20,000; Canandaigua Village, Ontario County, 1.19 miles, to Clarence Aikenhead Co., Rochester, $22,000; other bidders, Thomas Holahan, $23,000; Hagaman, Miller & Hagaman, Rochester, $23,000; Mohawk Engineering and Construction Co., Schenectady, $23,487; Whitmore, Rauber & Vicinus, Rochester, $22,200; Schroeder-Hicks Contracting Co., $23,900; Monroe County, part 2, fourth section, 5.75 miles, to Frederick A. Brotsch, $40,500; other bidders, Ripton & Murphy, Chambers & Grady, Rochester; F. V. C. Bardol; Whitmore, Rauber & Vicinus, Joseph Dunphy, Syracuse; Schroeder-Hicks Construction Co., Frank L. Cohen, John Miller, Buffalo; John Palace, Lockport; Thomas Holahan, Hucknoll Construction Co., Albion.

Albany, N. Y.—State road improvements: Road No. 786, Cherry Valley-Roseboom, Otsego Co., 3.76 miles, to Dorpian City Construction Co., Schenectady, $35,803; Road No. 848, Long Lake Grove, Hamilton Co., 3.76 miles, to J. D. Moynihan, Herkimer, $44,900; Road 596-A, Norwich-So. New Berlin, Chenango Co., 0.34 mile, to Newport Construction Co., Newport, N. Y., $4,600; Road No. 628, Rock City-Lafayetteville, Dutchess Co., 4.66 miles, to Harper, Jovah & Kehoe, Inc., Newburg, $40,800; Road No. 555, E. Syracuse-Chittenango, Onondaga Co., 7.79 miles, to E. Brown Baker, Herkimer, $85,741, residuum products; Road No. 5052, New Hartford Village, Oneida Co., 0.65 mile, to E. J. Doyle, Albany, $18,765; Road No. 847, Copenhagen-Lowville, Part 2, Lewis Co., 5.74 miles to P. H. Murray, Rochester, $62,558, Trinidad; Road No. 5040, Hoosick Falls Village, continued, Rensselaer Co., 1.56 miles, to F. L. Cohen, Buffalo, $54,600; John B. Dower, Ballston Spa., $51,900, Burmudez; Road No. 661, Oswego-W. 5th st., continued, Fruit Valley, Oswego Co., 3.58 miles, to P. H. Murray, Rochester, $34,502; Road No. 5008, Jerico turnpike, Suffolk Co., 3.56 miles, to Joseph A. Boyce, Long Island City, $38,596, residuum products; Road No. 755, Altamont-Knox, Albany Co., 4.25 miles, to John Harrington, Albany, $45,760; Road No. 494, East Henrietta-Rochester, Monroe Co., 4.43 miles, to Frederick A. Brotsch, Rochester, $49,500, residuum products; Road No. 812, Canastota-South Bay, Madison Co., 1.81 miles, to P. H. Murray, Rochester, $46,944, residuum products; Road No. 5042, Auburn-Seneca Falls, Part 2, Seneca-Cayuga counties, 3.33 miles, to F. A. Brotsch, Rochester, $55,500, residuum products; Road No. 851, Hilton Village, Monroe Co., 1.11 miles, to Clarence Aikenhead, Rochester, $14,000, residuum products, Road No. 5049, Waverly-Owego, Part 1, Tioga Co., 2.58 miles, to E. Whalen, Towanda, Pa., $31,306.80, residuum products; Road No. 729, Shawnee-Cambria, Niagara Co., 3.20 miles, to Frank L. Cohen, Buffalo, $23,300; Road No. 855, Mount Morris Village, Livingston Co., 0.47 mile, to Schroeder, Hicks Construction Co., Rochester, $7,300; Road No. 661, Oswego-W. 5th st., Fruit Valley, Oswego Co., 3.58 miles, to Chambers & Grady, Rochester, $33,688, residuum products; Road No. 682, Ithaca-Dryden, Part 2, Tompkins Co., 3.95 miles, to P. D. Conley, Ithaca, $40,177.45; Road No. 5053, Levant-Poland Center, to Northwestern Construction Co., Franklin, Pa., $38,596, Trinidad.

Lockport, N. Y.—Grading, curbing and paving Market st., to C. N. Stainthorpe & Co., entire work, $17,500; other bidders, Stainthorpe & Co., not including any work between International railway tracks and for 2 ft. outside of tracks, $14,338; Whitmore & Co., entire work, $22,800; Whitmore & Co., not including work between and outside railroad tracks, $18,400.

Gallitzin, Pa.—Paving, 9,000 sq. lds., to Anthony Anstead & Co., city, $22,232.

Meadville, Pa.—Building sidewalks, cement walk, to E. E. Waid, 7⅞c. per sq. ft.; other bidders, Thos. McGuigan, 10½c. and 30c. a cu. yd. for extra filling; the Vetter Construction Co., 12½c.; for stone walk, to Arthur Grindrod, 14c. for 2-in. stone and 17c. for 2½-in. stone.

Scranton, Pa.—Paving Scranton st. from Lackawanna Railroad crossing to Chestnut ave., Belgian block, to Salvatore Di Martino, $2.34 per sq. yd.

Richmond, Va.—Curb and gutter, to P. J. Smith & Co., at about $10,000.

Spokane, Wash.—Paving, Browne's addition, to J. F. Hill, Chicago, $512,000; maintenance, five years, $9,850.

Tacoma, Wash.—Grading Alaska st., to Puget Sound Stone Block Co., $12,200.

Milwaukee, Wis.—Extending Lake Shore drive, to W. H. Gillen, $25,000.

Superior, Wis.—Paving, Hughitt ave., to Differ & Riches, $24,408.

Edmonton, Alta., Can.—Bitulithic paving, 3,000 sq. yds., to Bitulithic & Contracting, Ltd.

BIDS RECEIVED

Los Angeles, Cal.—Road improvements: (a) Improving Whittier road; (b) grading and constructing culverts in Sections 1 and 2. Bidders: Barber Asphalt Paving Co., Central Bldg., (a) $13,927, (b) $12,456; Garnesy & Pitzer, (a) $15,542, (b) $15,029; C. W. Brashear, (a) $17,200, (b) $18,400.

Hartford, Conn.—State road work: Town of Woodstock, 1,300 lin. ft. gravel-telford road on the Quinnebaug Turnpike including two 24-in. tile culverts, A. Vito, Thompson, Conn., $1.75 per lin. ft. for gravel and $2.50 for telford; also 8,500 lin. ft. gravel-telford road on the Eastford road, including two 20-in., three 24-in., two 12-in. and one 15-in. tile culverts, A. Vito, $1.65 for gravel, $2.40 for telford and $1.05 per lin. ft. for rubble drain; town of Tolland, 1,200 lin. ft. gravel road on Sand Hill, including one 12-in. iron culvert, O. T. Benedict, Pittsfield, Mass., $2.99 per lin. ft. for gravel, $3.59 for telford, 80c. for rubble drain and $6 per cu. yd. for masonry walls; Amos Bridge's Sons, Hazardville, Conn., $3.62, $4.33, $1.25 and $7; A. C. Sternberg & Sons, West Hartford, $2.75, 75c., $1 and $5; on the West Willington road including also 13,060 lin. ft. grading and hardening, two 20-in., four 24-in., three 18-in. and three 15-in. tile culverts, F. Arrigoni & Bro., Durham, $29,450 for grading, 60c. per lin. ft. for telford, $1.25 per lin. ft. for rubble drain: B. D. Pierce, Jr., Co., Bridgeport, $29,500, 75c., 75c.; A. Vito, Thompson, Conn., $29,103, 75c. $1; O. T. Benedict, Pittsfield, Mass., $27,999, 60c., 80c.; Amos Bridge's Sons, Hazardville, $32,500, 60c., $1.25; A. C. Sternberg & Sons, West Hartford, $35,300, 75c., $1; town of Hampton, 9,300 lin. ft. graded road, including four 24-in. tile culverts, F. Arrigoni & Bro., Durham, $16,975 for grading, 60c. per lin. ft. for telford, $1.25 per lin. ft. for rubble drain; Roger Kennedy, Middletown, $19,200, 70c., $1.10; A. Vito, Thompson, $14,350, 75c., $1; O. T. Benedict, Pittsfield, Mass., $15,999, 60c., 80c.

New Haven, Conn.—Asphalting parts of Main st. Bidders: Southern New England Paving Co., $1.59 sq. yd., $15.60 cu. yd. for concrete binder and $6.35 cu. yd. for Portland cement concrete; Barber Asphalt Co., $1.73, $16 and $6.50.

Ft. Du Pont, Delaware City, Del.—Road improvements: (a) 1,934 sq. yds. macadam paving, and (b) 3,777 sq. ft. of granolithic sidewalks. Bidders: B. F. Wickersham, Kennett Square, Pa., (a) $1.22, (b) 18c.; H. C. Clark, Delaware City, (a) $1.09, (b) 18.9c.; Filbert Packing & Construction Co., (a) $1.10, (b) 13c.; M. McManus Contr. Co., (a) $1.41, (b) 22½c.; Wm. A. Mundy, (a) $1.70, (b) 28c.

Atlanta, Ga.—Total of bids, including bags, for furnishing 10,000 bbls. Portland cement at U. S. penitentiary: Dunning & Son, Atlanta, Ga., $19,600; Universal Portland Cement Co., Pittsburg, Pa., $21,000; Sciple Sons, Atlanta, Ga., $17,900; Atlas Portland Cement Co., New York, N. Y., $19,000.

Fall River, Mass.—Laying granolithic sidewalks, Walter F. Conway, $1.29¼ per sq. yd.; Beattie & Cornell, $1.36½, and O'Connor & Angell, $1.43¾; bids rejected.

Detroit, Mich.—Constructing roads: (a) Michigan ave., 2.41 miles, (b) Grand River road, 1.48 miles and Woodward ave. road, 1.23 miles. Bidders: Owosso Constr. Co., (a) $27,072, (c) $14,005; F. Porath & Sons, (a) $36,427, (b) $19,391, (c) $16,466; R. D. Baker, (b) $18,391, (c) $16,101.

Grand Rapids, Mich.—Paving, lowest bidders: Carpenter & Anderson, with brick, Lake ave., $7,657, and with bituminous macadam, E. Fulton st., $11,064; D. W. Boyes, paving Walker ave. and 7th st., $25,925.

Syracuse, N. Y.—Resurfacing Furman st.: Warner-Quinlan Asphalt Co., low bidder, $5,796.38; the Central City Paving Co., $5,986.36; Trinidad asphalt will be used.

Scranton, Pa.—Paving Scranton st., D. L. & W. crossing to Chestnut st., asphalt: R. C. Ruthven, $1.99 per sq. yd.; Filbert Paving & Construction Co., $2.05 per sq. yd.; MacDonald Construction Co., $1.73 per sq. yd., and Warner-Quinlan Co., $1.99; Jackson st., from Bromley Ave. to Van Buren ave., asphalt: R. C. Ruthven, $1.99; Filbert Paving Co., $2.05; MacDonald Construction Co., $1.75; Warner-Quinlan Co., $1.99; South Bromley ave., from Jackson st. to Washburn st., asphalt; bids and bidders same as for previous jobs; Scranton st. from D. L. & W. crossing to Chestnut st., stone block: J. G. Rosar, $2.37 per sq. yd.; Dale & Gaynor, $2.37; William Brown & Co., $2.23; Salvatore Di Martino, $2.34; MacDonald Construction Co., $2.31.

Spokane, Wash.—Paving Browne's addition: J. F. Hill, Chicago, $512,000; maintenance, 5 years, $9,850; Mitchell Brothers, Spokane, $553,000; maintenance, $25,000; Independent Asphalt Co., Spokane, $513,400; maintenance, $16,000; Warner-Quinlan Asphalt Co., Syracuse, N. Y., $538,627.50; maintenance, $30,000, and P. J. McHugh, Seattle, $587,140; maintenance, $12,750.

SEWERAGE

Birmingham, Ala.—City will soon invite bids for construction of two north side sewers to cost $440,000.—Maury Nicholson, City Engineer.

Riverside, Ala.—Riverside City Development Co. will construct sewer system.

Phœnix, Ariz.—Citizens will vote about May 1 on $400,000 bonds for construction of a new sewer system.—Lloyd B. Christy, Mayor.

Petaluma, Cal.—City is considering constructing 6-in. pipe sewers in four streets.—N. S. Frost, City Engineer.

Roseville, Cal.—Trustees are considering plans for construction of sewer system; excavating and back filling ditches, $14,132; laying and furnishing sewer pipe, $12,679; manholes, covers and concrete work, $2,780; septic tank and accessories, $5,380; 35,575 ft. of 6-in. laterals and manholes, laying, etc., $19,562; 10 per cent for superintendence, $6,300; bridge across Dry Creek, $1,500.

Denver, Col.—Board of Public Works has adopted plans for proposed construction of storm sewers for portion of subdistrict No. 2.—W. B. Lowrey, President.

Salida, Col.—State Engineer O'Brien, Denver, has recommended installation of sewer system. Address Mayor Buchanan.

Waterbury, Conn.—Board of Works is considering construction of sewers on three streets and sidewalks on Steuben st.

Macon, Ga.—North Highland residents are urging construction of sewers.

Chicago Heights, Ill.—Construction of 12 miles of sanitary sewers and 50 miles of storm water sewers is considered.—A. L. Fox, City Engineer.

Pekin, Ill.—Sewer will be constructed in 6th st.—John R. Seibert, Engineer.

Princeton, Ill.—Surveys have been completed by W. S. Shields, 140 Dearborn st., Chicago, for sewer system in south end; cost about $30,500.

Indianapolis, Ind.—Mayor Shank will take up construction of sewage disposal plant with City Engineer Clausmann and Advisory Commission; cost about $750,000.

Vincennes, Ind.—Hering & Fuller have completed survey for complete system of storm and sanitary sewers.

Cedar Falls, Ia.—One mile of sanitary sewers will be constructed.—C. H. Streeter, City Engineer.

Davenport, Ia.—Vit. pipe sanitary and tile block storm drains will be constructed in five streets.—Thomas Murray, City Engineer.

Missouri Valley, Ia.—Missouri Valley has completed plans and arrangements for complete sewerage system; cost, $78,600.

Lawrence, Kan.—Spicket River Commission will call for bids for building sewer in Lake st.—A. D. Marble, City Engineer.

St. Francisville, La.—City is considering construction of sewer system.

Chestertown, Md.—Citizens will vote April 25 on issuance of sewerage bonds.

Lenox, Mass.—Wm. S. Johnson recommended $29,300 expenditure for 2 miles of new sewers, extension of main sewer, settling tanks, sludge beds and filter beds.

Lowell, Mass.—Council has voted $50,000 loan for sewer work.

New Bedford, Mass.—Board of Aldermen has ordered sewers laid at cost of $8,800.

Menominee, Mich.—Plans and specifications have been prepared for construction of sewer on Michigan ave. and one on Myrtle st.—Albert Hass, City Engineer.

South Haven, Mich.—Council has approved plans for construction of 4 sewers.

Austin, Minn.—City has decided to con-

struct 1½ blocks of sanitary sewer and 2 blocks of storm sewers.—M. N. Claussen, City Engineer.

Kansas City, Mo.—Citizens have voted $100,000 sewer bonds.

Kirksville, Mo.—Storm sewers will be constructed in three streets.—Benjamin Crabtree, City Engineer.

Whitefish, Mont.—Citizens have voted $10,000 bonds for construction of sewer system.

Paterson, N. J.—Board of Public Works has decided to construct sewers in four streets.—J. T. Brett, City Street Commissioner.

Phillipsburg, N. J.—City has decided to construct 1,000 lin. ft. of concrete storm sewers.—Robt. R. Howell, City Engineer.

Rutherford, N. J.—Construction of vit. pipe sewers in several streets is being considered.—R. M. Watson, City Engineer.

Albany, N. Y.—Concrete and vit. pipe sewers will be constructed in six streets.—Walter Melius, City Engineer.

Alexandria Bay, N. Y.—Citizens have voted bonds for construction of system of sewers.

Binghamton, N. Y.—George L. Robinson, Sanitary Engineer, 1 Madison ave., New York, is the expert who has been selected to assist the City Engineer in designing intercepting sewer system and sewage disposal plant for city.—John A. Giles, City Engineer.

Ogdensburg, N. Y.—Construction of 5,000 ft. of tile sewers is being considered.—Geo. S. Tate, City Engineer.

Olean, N. Y.—Vit. pipe sewers will be constructed in seven streets.—Geo. J. Ball, City Engineer.

Oneida, N. Y.—City is considering construction of two blocks of vit. pipe sewers.—G. S. Tibbits, City Engineer.

Plattsburg, N. Y.—City has decided to make repairs and extensions in two or more sewers.—R. H. Rogers, Superintendent of Public Works.

Schenectady, N. Y.—Council is considering construction of surface water sewers on upper State st.

Seneca Falls, N. Y.—All houses in Cayuga and Fall sts. must be connected with sewers.—W. M. Follett, Health Officer.

Syracuse, N. Y.—City Engineer Henry C. Allen has estimated cost of constructing 12-in. sewers in three streets at $2,100.

Alliance, O.—Bids will be received April 27 by C. O. Silver, City Auditor, for $163,500 sewer and street improvement bonds.

Alliance, O.—City has decided to construct sanitary sewers in portions of six streets.—A. A. Kotte, City Engineer.

Galion, O.—City has secured site for proposed sewage disposal plant.

Jefferson, O.—Reduction plant will be constructed for sewer system; $20,000 bonds voted.—H. J. Redmond, Mayor.

Mansfield, O.—Council has ordered plans for constructing 8-in. sewer on S. Franklin st.

Springfield, O.—City Engineer has prepared estimates for construction of five sanitary and two relief sewers.

Hugo, Okla.—City will soon award contract for installation of sewerage system.

Norman, Okla.—Citizens have voted $15,000 sewer bonds.

Poteau, Okla.—Citizens have voted $40,000 sewer bonds.

Carbondale, Pa.—Mayor A. L. Sabin has recommended sewering of streets.

McKees Rocks, Pa.—Borough will construct brick or concrete sewers.—Geo. H. McGinnes, Borough Engineer.

Port Vue, Pa.—Sewer Committee is considering construction of sewers in Sylvan and Monroe aves.

Reading, Pa.—Council is considering ordinances for extending storm water sewers in portions of five streets; also passed bill appropriating $73,400 to Board of Public Works for sewers; city is considering bond issue for furthering work on sewers.

Scranton, Pa.—Mayor John Von Bergen, Jr., has recommended system of relief sewers.

Titusville, Pa.—Borough has decided to construct tile sewers in six streets.—H. H. Holstein, Borough Engineer.

Wescosville, Pa.—Lehigh County Board of Commissioners will advertise for bids for sewage disposal plant for the Lehigh County Home; cost approximately $20,000.—R. S. Ratabun, Allentown, Engineer.

Aberdeen, S. D.—City has decided to construct 1½ miles of 10-in. tile sewers in four streets.—D. Cuyler Washburn, City Engineer.

Scotland, S. D.—Council is considering construction of sewer system.

Erwin, Tenn.—City will construct about four miles of sanitary sewer.—Wm. M. Dunlap, Johnson City, Engineer.

Beaumont, Tex.—City has sold $50,000 sewer bonds to Thos. J. Bolger Co., Chicago.

Clarksville, Tex.—City is considering construction of sewer system.

Mount Pleasant, Tex.—City is considering election on bond issue for construction of complete sewerage system.

Petersburg, Va.—Council is considering construction of sewers on Pearl and Gill sts.

Chehalis, Wash.—City Engineer Herman has estimated cost of proposed sewer and drainage district to take care of eastern and southern portion of city at $80,000.

Kennewick, Wash.—H. Day Hanford, Civil Engineer, Seattle, has submitted preliminary plans for sewer system to the Council; Resident Engineer Wright will supply additional profiles and system will be installed at once.

Tacoma, Wash.—Citizens have voted $100,000 for west end drainage system.

Beloit, Wis.—Council has established new sewer district in north end of Second Ward.

Montreal, Que., Can.—The Board of Control is considering closing of outlet of city sewer that empties into Elgin basin and building a sewer along Commissioner st. to outlet of Craig st. sewer; cost about $220,000.

Souris, Man., Can.—Surveys are being made for proposed sewage disposal and water works systems.

CONTRACTS AWARDED

Imperial, Cal.—Sewer system, to Arthur S. Bent, 346 Central Bldg., Los Angeles, $3,346.

Pasadena, Cal.—Septic tank, to Olmstead & Gilleland, Los Angeles, $10,500.

Riverside, Cal.—Sewers in Market st., to Johnson-Shea Co., $7,848.

Atlanta, Ga.—Seven miles of sewerage for Druid Hills Co., to Dysard Construction Co., city.—O. F. Kaufman, Chief Engineer.

Michigan City, Ind.—Sewers, Willard ave., to W. H. Bell and Peter Michaely; section from 8th st. to railroad, $8.80 lin. ft.; 4-ft. 6-in. section, $5.02; 27-in. section, $4.98; 24-in. section, $4.98. Tyron st., to same firm, 24-in. pipe, $3.32 per lin. ft.; 20-in. pipe, $2.35; 18-in. pipe, $1.21; 15-in. pipe, $1.06; 12-in. pipe, 63c.

Hamburg, Ia.—Sewers, to Dunnegan & Corey, $8,181.

Eveleth, Minn.—Catch basins and sewer system, to Pastoret & Lawrence Co., Duluth, $21,400; excavating all sewer and street rock, to same company, 80c. per cu. yd.

Rochester, N. Y.—Humboldt st. sewer, to William H. Sours, city, $21,027.

Rochester, N. Y.—Sewers, to Petrossi Co., Pansy st., $1,205, and Masseth st., $678.

Ada, Okla.—Construction of sanitary lateral sewers in District 3, consisting of 10,150 lin. ft. 12 and 8-in. pipe, with necessary appurtenances, to Gilkerson & Levy, Muskogee, $8,128.

Richmond, Va.—Sewers: to Burton & Driscoll, West and other streets, $18,948.50; West Cary st., $8,428; Shepherd st., $14,370.90; West st., $8,426.35; to J. C. Cheatwood, N. 17th st., $6,986.28; to I. J. Smith & Co., W. Cary st., $7,716.57.

Elm Grove, W. Va.—Sewer, Kruger st. to Wheeling Creek, to Wm. Spindler, Edgedale.

Burlington, Wis.—Sanitary sewers, to Herman Hohensee, Milwaukee, $3,966.

BIDS RECEIVED

Hartford, Conn.—Homestead ave. sewer, Ryan-Unmack Co., New Haven, lowest bidder, $22,033. For concrete construction Homestead ave. sewer: Ryan-Unmack Co., New Haven, concrete $22,033, brick $31,151.60; concrete invert with brick arch $26,651; Berardino, Silvestri & Conti, Hartford, concrete $26,897.50, brick $26,897.50, concrete invert with brick arch $26,985; A. W. Bryne, Boston, Mass., concrete $26,985, brick $26,985, concrete invert with brick arch $26,985; Chas. H. Slocomb, Hartford, concrete $27,042.50, brick $30,167.50, concrete invert with brick arch $27,042.50; F. B. & W. H. O'Neil, Hartford, concrete invert with brick arch $27,800; Hartford Paving & Construction Co, concrete $33,214.50, brick $37,794.50, concrete invert with brick arch $39,331; F. T. Ley & Co., Inc., Springfield, Mass, concrete $43,737.50. Albany ave. sewer: Charles H. Slocomb, 5 days, $321; Hartford Paving & Construction Co., 5 days, $354; Bernardino, Silvestri & Conti, 7 days, $328; Dominic Nero, 7 days, $372.40; Louis Rogers, 10 days, $357.40; F. B. & W. H. O'Neil, 4 days, $331.

Hoboken, N. J.—Rebuilding 1st st. sewer, Thomas Kavanagh, lowest bidder, $24,992.

Comstock, N. Y.—Construction of sewage disposal system at Great Meadow prison: Hudson Valley Construction Co., Troy, $7,734; New York Sewage Disposal Co., New York, $10,910; John M. Holler, Albany, $11,445; M. Fitzgerald, Hoosick Falls, $9,125; Welles-Boughton & Co., Troy, $8,966; Thomas Dunn, Saratoga, $12,200; Kennedy & Easton Construction Co., Albany, $12,785; Wing, Reixinger & Wing, Buffalo, $11,590; Eveline Bros., Waterford, $9,480; Charles R. Lewis, Ilion, $11,497.—F. B. Ware, State Architect.

WATER SUPPLY

Riverside, Ala.—Riverside City Development Co. will construct water works.

Alameda, Cal.—Peoples' Water Co. will install new pipes throughout city.

Los Angeles, Cal.—Hollywood residents are urging installation of fire hydrants.

Orland, Cal.—Committee composed of Town Trustees Wright, Rawlins and Hazleton has secured suitable location for city water works plant and obtained data on cost of same.

Durango, Col.—Citizens have voted $25,000 water bonds for construction of gravity system.

New Britain, Conn.—Water Department will build reservoir instead of standpipe on Pierre farm; cost $20,000; Engineer Blake will prepare working plans.

Jacksonville, Fla.—Council has adopted resolution providing for construction of water works and electric light plant; cost $300,000.—W. M. Bostwick, Jr., Chairman Board of Bond Trustees.

Titusville, Fla.—Council is considering plans and specifications for water works system.

Atlanta, Ga.—Corporation Underwriting Syndicate, 614 Rhodes Bldg., is interested in estimates on water plants.

Donaldsonville, Ga.—Citizens will vote May 10 on bonds for installation of water works system.

Elberton, Ga.—City is considering installation of additional filters.—G. W. Hubbard, Superintendent.

Union City, Ga.—Citizens have voted $20,000 bonds for water works and other improvements.—D. A. Carmical, Mayor.

Canton, Ill.—City Engineer Carl Beam has recommended purchase of pumping engine at Ave. D pumping station.

Carlyle, Ill.—City is considering construction of clear water system by means of wells, to be connected with the present water plant.—John J. McGaffigan, City Attorney.

Carpenterville, Ill.—Town will vote on $16,000 bonds to install water plant.

Pekin, Ill.—Board of Aldermen is considering resolution for laying 6-in. water main on Park ave.

South Bend, Ind.—City is considering construction of deep wells, 100 ft. deep.

Cedar Falls, Ia.—City will lay one mile of water mains.—C. H. Streeter, City Engineer.

Hampton, Ia.—City contemplates laying 1,800 ft. additional mains and purchasing power pump, capacity 250 gals. per minute.—G. E. Sargent, Superintendent.

Jewell, Ia.—Town will spend $5,000 on water system.

Salix, Ia.—Town is in need of more adequate water supply.

Jamestown, Kan.—Bids will be received April 22 for constructing water works and electric lighting plant as follows: Furnishing material and labor, except standpipe, and constructing a complete water works system, furnishing material and constructing a transmission line from Concordia to Jamestown about 12 miles; and electric lighting system for Jamestown; furnishing material and erecting water tower, 30,000-gal. capacity, 100 ft. high.—F. M. Cook, City Clerk. Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., Engineers.

Quinan, Kan.—Town will spend $5,000 in improving water plant.

Louisville, Ky.—Board of Water Works is considering installation of 12-in. instead of 8-in. pipe from Crescent Hill standpipe to Lakeland; cost $75,000.

Baton Rouge, La.—Baton Rouge Water Co., has been reorganized with $200,000 capital stock and C. C. Bird, president; will make improvements to plant.

Morgan City, La.—City is considering construction of water works; cost about $30,000.—Charles L. Wise, Mayor.

Lewiston, Me.—Superintendent Langley has recommended replacing of present sewer with larger pipe and gradual adoption of meter system.

Berlin, Md.—Council has decided to extend water and electric light improvements.

Frostburg, Md.—Governor Crothers has signed bill for installation of water works.

Boston, Mass.—Committee on Water Supply has reported favorably bill authorizing town of Methuen to borrow $30,000 for purpose of extending water system.

Gloucester, Mass.—Water Commissioners are considering extension of water mains to Starknaught Heights.

Rockland, Mass.—Joint Water Boards of Abington and Rockland will receive bids for erection of rein. concrete standpipe on Beech Hill. Address S. W. Baker, Secretary Abington and Rockland Water Works.

Hancock, Mich.—Plans have been adopted for proposed reservoir; cost $12,000.

Holland, Mich.—Plans have been prepared by City Engineer H. A. Naberhius for water mains in various streets.

Stillwater, Minn.—City is considering $145,000 bond issue for purchase of water works.

Albert Lea, Minn.—Bids wil be opened April 26 for construction of 1,962 ft. 6-in. and 952 ft. 4-in. water mains, 4 fire hydrants, 8 6-in. gates and 2 4-in. gates.—Wm. Barneck, City Engineer.

Virginia, Minn.—Council has ordered Virginia Electric Power and Water Co. to extend water mains on several streets.—A. E. Bickford, City Clerk.

Walker, Minn.—Bids will be received by Edw. L. Rogers, Village Recorder, for 700 ft. of steel pipe.

Crystal Springs, Miss.—City will construct 100-ft. steel tower and 125,000-gal. steel tank.—C. Plummer, City Engineer.

Osyka, Miss.—City is considering construction of water works and drilling artesian well; will erect brick building; bids opened June or July.—X. A. Kramer, Magnolia, Engineer.

Vicksburg, Miss.—Council is considering purchase of present water works system instead of constructing system, as has been authorized.—George W. Fuller, New York, Consulting Engineer.

California, Mo.—City will install $30,000 water system.

Carthage, Mo.—Council is considering installation of meter system.

Kennett, Mo.—Citizens have voted $40,000 bond issue for construction of water works; about nine miles of pipe will be laid.

Kirksville, Mo.—City is considering improvements to water works system.—Benjamin Crabtree, City Engineer.

Libby, Mont.—J. F. Reynaud, Sandpoint, has asked for water works and electric light franchise.

Creston, Neb.—Citizens have voted to construct water works; engineer not yet selected.—C. E. Wagner, Village Clerk.

Kenesaw, Neb.—Town has voted $20,000 for water works plant.

Hinsdale, N. H.—City will lay two miles of 6-in., 8-in., 10-in. and 12-in. pipe and set 34 hydrants.

Hawthorne, N. J.—Town is considering installation of water system. Address Mayor Renz.

Jersey City, N. J.—Governor Fort has approved bill allowing city to issue $500,000 bonds for water mains.

Alexandria Bay, N. Y.—Citizens have voted bonds for construction of system of water works and sewers.—J. S. Keeler, City Engineer.

Ogdensburg, N. Y.—City is considering construction of sand filters and standpipe.—Geo. S. Tate, City Engineer.

Olean, N. Y.—City is considering water main extensions.—Geo. J. Ball, City Engineer.

Plattsburg, N. Y.—City has decided to make extensions to water works.—R. H. Rogers, Superintendent.

Schenectady, N. Y.—Board of Estimate is favorable to building of reservoir in northeastern part of city.

Jamestown, N. D.—Council is considering repair of James River Dam. Address Mayor Blewett.

Washburn, N. D.—Citizens have voted to install municipal water works system.

Lorain, O.—City will install a 48-in. intake pipe; cost $55,000.—C. M. Osborn, City Engineer.

Millersburg, O.—City has passed $8,000 bond issue for water works system.

Altus, Okla.—Council has selected J. W. Maxcy Co., Scanlan Bldg., Houston, Tex., as Engineer in charge of improvements to water works; $130,000 available.

El Reno, Okla.—Citizens have voted $250,000 water works bonds.

Fairfax, Okla.—Citizens will vote on $50,000 bonds for construction of water works.

Middletown, Pa.—Burgess C. B. Erisman has recommended replacing of 4-in. water mains with 6-in. or 8-in. mains.

Woonsocket, R. I.—Board of Aldermen has appropriated $11,000 for water department construction.

Ensley, S. C.—Town will vote on installation of water system.

Florence, S. C.—Florence Electric and Water Co. has been incorporated with $100,000 capital stock by P. A. Wilcox and J. S. Mitchell.

Alpine, Tex.—City is considering further water works construction.

Childress, Tex.—Citizens have voted water works bonds.

Dallas, Tex.—Bids will be received this spring for laying 3½ miles 36-in. water mains; pipe purchased.—J. M. Preston, City Engineer.

Humble, Tex.—Humble Water, Light and Ice Co. has been incorporated with $12,000 capital stock by W. E. Sholar, Charles S. Polk and E. L. Cullum.

Mesquite, Tex.—B. H. Reid, Fort Worth, is promoting organization of company to construct water works.

San Antonio, Tex.—San Antonio Water Supply Co. is considering improvements to water works, including rebuilding of pumping station.—C. H. Surkamp, Jr., General Manager.

Tyler, Tex.—City is considering $10,000 expenditure for extending water mains.

Manti, Utah.—Citizens have voted $15,000 bonds for water works. Bids for bonds will be received about May 15.—C. Axcelsen, City Recorder.

Mt. Jackson, Va.—Town has voted to install gravity water system; cost $15,000.

Colville, Wash.—Council has ordered water main laid on Still st. as far as city limits.

Deer Park, Wash.—Commercial Club is urging Council to take up construction of water works system.

Meadow Lake, Wash.—City will install water works system.

Spokane, Wash.—Water Department is considering construction of water mains on Regal st.

Tacoma, Wash.—Citizens have voted $2,000,000 bonds for Green River gravity water system.

Keystone, W. Va.—Citizens have voted $28,000 bonds for improvement of water works and erection of jail.

Milwaukee, Wis.—Bids will be received April 22, 10.30 a. m., by Board of Public Works, for repair of the intake crib located in Lake Michigan.

Burnaby, B. C., Can.—City will shortly call for tenders for water works construction.

St. Lambert, Que., Can.—Council has ordered preparation of specifications with view to ascertain cost of extending the water and sewer mains to Southwark.

Sawyerville, Que., Can.—Citizens have passed a by-law authorizing Council to buy water works from the Sawyerville Water Co.

CONTRACTS AWARDED

Fort Morgan, Ala.—Three reinforced concrete cisterns, to N. C. Pease, Atlanta, Ga., $4,790.

Biggs, Cal.—Equipments for city water system and a galvanized steel tower 30 ft. high, also a 700-lb. bell of California manufacture, and 2,000 ft. of 4 and 1,000 ft. of 1-in. water pipe, tees, valves, standpipes and hydrants, to W. M. Doty.

Los Angeles, Cal.—Furnishing c.-i. water pipe, to U. S. Cast Iron Pipe and Foundry Co., 36-in. $34.25, 12 to 6-in. $33.25; 4-in. $34.25; two 20-in. gate valves, flanged, to Pacific Coast Supply Co., at $125.50 each; gate valves, to Crane Co., following unit prices; 18 valves 12-in. $30.55, 10 valves, 10-in. $22.06; 15 valves, 8-in. $13.45, 200 valves, 6-in. $7.44, 250 valves, 4-in. $4.81.—Jas. P. Vroman, Secretary.

New Bedford, Mass.—Supplying Water Department with lead service pipe, to New Bedford Boiler and Machine Co., $5.04 per 100 lbs.

Detroit, Minn.—Extension of the water mains, to James A. Trane, of La Crosse, Wis., $11,741.—L. P. Wolff, St. Paul, Engineer.

Gilbert, Minn.—Extension of water works, to Pastoret & Lawrence, Duluth; 85,758 ft. 6-in. pipe, $1.07 per ft.; 4-in. pipe, 83c.; 5,000 ft. specials, 4c. per lb.; hydrants and 4-in. pipe in place, $44; rock excavation, $4.50 per yd.; total about $11,400.

Rochester, N. Y.—Laying water mains to Ripton & Murphy; group 233, $5,162.70, and group 234, $3,482.20.

Lisbon, O.—Cast-iron pipe, to Good Roads Machinery Co., Pittsburg, $1,000.

Ardmore, Okla.—Filtration plant at City Lake, to Geo. Erichsen, city, $10,457.

Bradford, Pa.—Reservoir to Wm. McIntire & Sons, Sharon, $100,000.

Tacoma, Wash.—Water main district in west end, to D. S. Williams & Co., $23,950.

BIDS RECEIVED

Fort Hancock, N. J.—Construction of pumping plant and installation of machinery at fort; construction of building and stack: Alamo Construction Co., New York, $22,300; Robert J. Walsh, Highlands, $21,000; John W. Danforth Co., Buffalo, $25,875; J. L. Sweigard & Co., Philadelphia, Pa., steel stack $4,000, alternate bid $3,868; McHarg-Barton Co., New York, $25,961; North Eastern Construction Co., New York, $32,277; Daniel J. Ryan, Brooklyn, $19,230; N. J. Foundry & Machine Co., New York, $24,335; Edward Fay & Son, 1521 Ranstead st., Philadelphia, $19,190; boilers, machinery, piping, etc.: John W. Danforth Co., Buffalo, $14,743; J. L. Sweigard & Co., Philadelphia, $21,996; alternate $17,762; M. L. Bayard & Co., Philadelphia, $17,450; McHarg-Barton Co., New York, $16,870; North Eastern Construction Co., New York, $15,412; N. J. Foundry & Machine Co., New York, $14,446, alternate, deduct $1,250; A. D. Granger Co., 90 West st., New York, $11,945; Edward Fay & Son, Philadelphia, $12,300; Walworth Mfg. Co., Boston, Mass., $17,200; construction, plumbing, boilers, machinery, piping, etc.; John W. Danforth Co., Buffalo, $39,865; G. & W. Mfg. Co., New York, $37,433, alternate $36,743; McHarg-Barton Co., New York, $41,840; Daniel J. Ryan, Brooklyn, $38,800; Edward Fay & Son, Philadelphia, $31,715.

LIGHTING AND POWER

Alabama City, Ala.—Council has decided to establish 12 new arc lights.

Guntersville, Ala.—Electric Co. will at once install plant.—Dr. D. C. Jordan, President.

Riverside, Ala.—Riverside City Development Co. will install electric light and power plant.

Berkeley, Cal.—Great Western Power Co. has asked for franchise to operate its lighting and power system.

Roseville, Cal.—Residents of Cherry Glen have petitioned Trustees for several new street lights.

Stockton, Cal.—Council will spend $35,000 for placing cluster lights along sidewalks on principal business streets of city.

Willows, Cal.—Northern California Power Co. is interesting people along Sycamore st. in a new scheme of illuminating that street.

Bridgeport, Conn.—Connecticut Co. is considering increasing of output of power plant to 5,000-kw.—C. H. Chapman, Superintendent.

Middletown, Conn.—Middletown Electric Light Co. will go ahead with erection of electric light plant at foot of College st.

Washington, D. C.—Catholic University will build central heating, lighting and power plant; cost $75,000.

Jacksonville, Fla.—Council has adopted resolution providing for construction of electric light plant and water works; cost $300,000.—W. M. Bostwick, Jr., Chairman Board of Bond Trustees.

Donaldsonville, Ga.—Citizens will vote May 10 on bonds for installation of electric light plant.

Savannah, Ga.—Flint River Power Co. has been incorporated with $1,000,000 capital stock by D. G. Zeigler and associates.—D. G. Zeigler & Co., Mutual Life Bldg., Jacksonville, Fla., Engineers.

Union City, Ga.—Citizens have voted $20,000 bonds for electric light and other improvements.—D. A. Carmical, Mayor.

Grangeville, Ida.—Council has granted Walter H. Hill 30-year franchise to construct and operate electric light and power system; cost of power plant about $100,000.

Connersville, Ind.—Connersville Light, Heat and Power Co. will soon ask for bids for enlarging and remodeling the plant.—Charles P. Stauffer, Secretary.

Crawfordsville, Ind.—Citizens will vote May 17 on installation of light and power plant; cost about $85,000.

Indianapolis, Ind.—The Circle Merchants' Association has decided to install special lighting system around Monument sq., consisting of a number of 640-c.p. arc lamps. R. E. Gregg, Hubert Keller and Norman Perry compose special committee.

Sullivan, Ind.—Sullivan Electric Co. has asked Council for extension of its contract to furnish street lighting for $60 a year a light; if this is assured, it will install $2,000 worth of new machinery at once; is also asking for meter basis of charge for incandescent lights.

Eagle Grove, Ia.—Citizens' Heat, Light and Power Co. will build brick addition to plant.

Ellsworth, Kan.—Town is raising $5,000 fund for purposes of prospecting for gas and oil.

Jamestown, Kan.—Bids will be received April 22 for constructing electric lighting and water works plant.—Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., Engineers. F. M. Cook, City Clerk.

Neodesha, Kan.—Citizens have voted bonds for municipal electric light plant.

Jackson, Ky.—Jackson Electric Co. has been granted new franchise for lighting streets; has contract with city for 135 lights.

Rayville, La.—City is considering $20,000 bond issue for construction of electric light plant and street paving.—George Wesley Smith, Mayor.

Shreveport, La.—Shreveport Gas, Electric Light and Power Co., 114 Texas st., will issue $600,000 bonds.—Rufus C. Dawes, 621 New York Life Bldg., Chicago, Ill., President.

Baltimore, Md.—Hospital Commission and Supervisors of City Charities have decided to construct central plant for lighting and heating all municipal buildings at Bayview and Sydenham Hospital.

Frederick, Md.—Officials of trolley systems of Frederick and Hagerstown are considering erection of joint power house.

Thurmont, Md.—Citizens have voted bonds for construction of electric light plant.

Minneapolis, Minn.—City has rejected all bids for ornamental street lights on steel arch bridge.

Morton, Minn.—Council has granted five-year franchise to Wherland Electric Light Co., Redwood Falls, for installation of electric light plant.

Clarksville, Mo.—City has granted fran-

chise to A. C. Hope, Carterville, to construct electric light plant.

Kansas City, Mo.—Metropolitan Street Railway Co. is considering erection of power house at 48th st and Broost ave. and additions at 15th and Grand aves.—R. J. Dunham, Chicago, Ill., Chairman Board of Directors.

Libby, Mont.—J. F. Reynaud, Sandpoint, has asked for electric light and water works franchise.

Milford, Neb.—Citizens have voted electric light bonds.

Atlantic Highlands, N. J.—Council has received applications for gas franchises from T. R. Beal and Judge J. E. Foster; former proposes to run pipe from plant at Keyport at $1.40 net; latter proposes to build plant and supply gas at $1.75 net.

Trenton, N. J.—New owners of Trenton Water Power Canal, who include David Wharton Pepper, Jr., of Philadelphia, will erect large power house on bank, either in this city or in Ewing Township.

Binghamton, N. Y.—Board of Estimate has set aside $700 for services of hydro-electrical engineer to aid Municipal Lighting Committee in making report on feasibility of municipal lighting plant.—J. A. Giles, City Engineer.

Lockport, N. Y.—Bids will be received about May 1 for lighting streets.

Rochester, N. Y.—Railway and Light Co. will install three large transformers at Elmwood station.

Wilson, N. Y.—Conant-Bryant Power Co. has been granted franchise to light streets.—R. G. Bryant, Buffalo, President.

Lima, O.—Natural Gas Co. has asked for re-enactment of franchise expiring in September; extensive improvements will be made.

Martins Ferry, O.—Council has voted to issue $18,000 bonds for improvements in municipal electric light plant.

Altus, Okla.—Council has selected J. W. Maxcy Engineering & Construction Co., Houston, Tex., to take charge of the work in connection with improvements to electric light and power plant; cost $35,000.

Durant, Okla.—Bids will be received in spring for electric light plant in connection with present city water works.

Medford, Ore.—J. R. Anderson has applied for franchise to erect gas plant; tanks and pipes to cost $100,000 will be installed.

Philadelphia, Pa.—Mayor Reyburn has signed ordinance providing for 870 new lights.

Port Vue, Pa.—Water and Light Committee will secure figures on cost of 10 or 12 arc lights.

Shamokin, Pa.—Coal Township Gas Co. and Coal Township Light, Heat and Power Co. will ask for charters to furnish gas and electricity. G. S. Schmidt, York; A. J. Hershey, E. P. Stair and J. A. Kellenberger are interested in both companies.

Wescosville, Pa.—Lehigh County Board of Commissioners will soon receive bids for lighting, power and fire service plant, complete, at the Lehigh County Home; cost $10,000.—R. S. Rathbun, Allentown, Engineer.

West Finley, Pa.—Plans have been completed for construction of a large pump station by the Natural Gas Co.

Florence, S. C.—Florence Electric and Water Co. has been incorporated with $100,000 capital stock by P. A. Wilcox and J. S. Mitchell.

Summerville, S. C.—Summerville Ice, Light and Power Co. has purchased plant of Crystal Ice Co. and will make improvements.—J. H. Heinsohn, President.

Shelbyville, Tenn.—Bedford Light and Power Co. has been incorporated with $8,000 capital stock by J. F. Boyd, J. E. Huffman and A. F. Trimble.

Houston Heights, Tex.—Council has granted gas franchise to H. W. Bennett, of Ohio; 15 miles of mains are to be laid in 18 months.

Mesquite, Tex.—B. H. Reid, Fort Worth, is interested in organization of company to construct electric light plant.

Port Arthur, Tex.—Port Arthur Water Co. will erect addition to power house and install 800-h.p. turbine engine and 150-h.p. ice machine.

Meadow Lake, Wash.—Installation of lighting system is being considered.

New Martinsville, W. Va.—Hope Natural Gas Co. will lay pipe line up Ohio River at cost of $1,000,000, to supply gas to Moundsville, Benwood, Wheeling, Wellsburg, Follansbee, New Cumberland, Chester, East Liverpool, O., Beaver Falls, Pa., New Brighton, Pa., and Parker, Pa.

Manitowoc, Wis.—Electric Light Co. is planning extensive improvements and changes.

Milwaukee, Wis.—Council has directed Board of Public Works to advertise for bids for street gas lighting.—Aug. M. Gavin, City Comptroller.

Belleville, Ont., Can.—City Engineer James G. Lindsay has recommended installation of two turbine pumps and two 85-h.p. motors at the water works; cost $5,000.

Brandon, Man., Can.—City Engineer Speakman has prepared plans for establishment of steam generating plant, capable of furnishing sufficient power to operate street lighting, street railway and pumping plant; cost $125,000.

Calgary, Alta., Can.—Commissioners have recommended that citizens vote on by-law to raise $125,000 for proposed municipal electric power plant; City Engineer Childs has completed plans.

CONTRACTS AWARDED

East Hartford, Conn.—Lighting streets of fire district, five years, to Hartford Electric Light Co., $17.50 per lamp per year.

Delaware City, Del.—Lighting town with Tungsten lamps, 15 years, to American Light and Power Co.

Washington, D. C.—Furnishing and installing power plant equipment at Indian Head, on Potomac River, to General Electric Co., Schenectady, N. Y., $76,669.

Waycross, Ga.—Equipment of plant for Ware County Light and Power Co., to Allis-Chalmers Co., Milwaukee, Wis.

Dorchester, Neb.—Forty street lamps, 50-c.p., to W. D. Crist, Omaha; cost $825 per annum.

Addison, N. Y.—Lighting streets for five years, 36 arc lights, to J. S. Hubbs, Hammondsport, $75 per year per light.

Columbus, O.—Equipment for Spring st. power plant of Columbus Railway and Light Co., as follows: To Jeffrey Mfg. Co., of Columbus for structural steel work for new plant and for coal and ash handling machinery; to Allis-Chalmers Co., Milwaukee, Wis., for turbo-generators with rating of 4,000-kw.; condensers, to Worthington Pump Co., of New York; boilers, to Babcock & Wilcox Co., 85 Liberty st., New York; to Green Fuel Economizer, of Chicago, Ill., for inducted draft fan apparatus and automatic stokers; cost about $200,000.

FIRE EQUIPMENT

El Dorado, Ark.—Fire department has been reorganized.—S. D. Crawford, Chief.

Grass Valley, Cal.—Eagle Hose Co. has decided to purchase four smoke nozzles, four pairs of smoke goggles and four more rubber coats.

Petaluma, Cal.—City is considering purchase of auto hose wagon, also installation of fire alarm system.—N. S. Frost, City Engineer.

Roseville, Cal.—Trustees have authorized purchase of two more hose carts.

Sunnyvale, Cal.—Town has voted $2,500 for fire protection; apparatus will be purchased.

Washington, Cal.—Town will equip department with hose reels and hose wagon; erection of fire house being considered.

Fairfield, Conn.—Purchase of motor apparatus is being considered.

Willimantic, Conn.—Purchasing Committee is considering purchase of 1,000 ft. 2½-in. hose and four Boston nozzles.—D. P. Dunn, Mayor.

Macon, Ga.—Council has ordered plans for erection of fire house in South Macon.

Decatur, Ill.—City is considering purchase of auto hose cart.—A. B. Alexander, City Engineer.

Marion, Ind.—Plans have been completed for erection of fire station at 14th and Branson sts.

South Bend, Ind.—Establishment of hose house in Sixth Ward is being considered.

Colby, Kan.—Bids will be received May 3, 3 p. m., for furnishing 1,000 ft. of 2½-in. hose and two hose reels.—Fred A. Wertz, Mayor.

Kansas City, Kan.—Bids will be received for one or two automobile combination hose and chemical wagons, with or without pump, 60 h.p.—C. S. Holbrook, Purchasing Agent.

Flemingsburg, Ky.—Council is considering purchase of another fire engine.

Lewiston, Me.—Fire Chief M. J. Moriarty has recommended erection of fire station and other improvements.

Baltimore, Md.—Owens & Sisco, Architects, are preparing plans for engine house to be erected on Baltimore st.

Hagerstown, Md.—Chief Fire Marshal John H. Middlekauff has recommended purchase of 2,000 ft. of hose.

Concord, Mass.—City will equip its hose wagons with motor apparatus; cost $7,000.

Ludlow, Mass.—Town will build $2,000 fire station.

Maynard, Mass.—Town has appropriated $650 for purchase of hose.

Williamstown, Mass.—Prudential Committee will purchase 1,000 ft. of hose. T. W. Nichols is interested.

Hancock, Mich.—Fire and Water Committee is considering erection of fire hall in west end of city.

Rose City, Mich.—Town is in need of fire equipment.

Biloxi, Miss.—City will advertise for bids for 500 ft. of fire hose, but 2,000 ft. may be purchased.

Walker, Mo.—Town is urging better fire protection.

Wolfeboro, N. H.—Town has appropriated $300 for hose wagon and $750 for electric fire alarm system.

Atlantic City, N. J.—Council has passed on final reading ordinances authorizing $35,000 bond issue for erection of engine house at Atlantic and California aves.; also for purchase of land on South California ave. for fire house purposes.

Bayonne, N. J.—Fire Chief Alfred Davis will recommend purchase of another chemical apparatus.

Phillipsburg, N. J.—City has decided to purchase 1,500 ft. of fire hose.—Robt. H. Howell, City Engineer.

Plainfield, N. J.—City will purchase fire hose.—Andrew J. Gavett, City Engineer.

Olean, N. Y.—Purchase of outfits for two fire department houses is being considered; also purchase of auto fire trucks.—Geo. J. Ball, City Engineer.

Port Jervis, N. Y.—City will at once purchase 500 ft. of hose and 21 rubber coats and repair two hose houses. Address Chief Engineer Harding.

Guthrie, Okla.—City will expend $30,000 for fire department supplies.—E. B. Hocker, City Engineer.

Ashbourne, Pa.—York Road Fire Co. is considering purchase of combination auto engine. J. Fennimore, Jr., is interested.

Chester, Pa.—Councils are preparing to establish fire alarm system; E. O. Mahon, Chief Engineer.

Coatesville, Pa.—Council has decided to purchase fire apparatus for Brandywine.

Harrisburg, Pa.—Pleasant View residents are urging better fire protection; cost of equipping fire company being ascertained.—Edgar Bowers, Chairman Special Committee.

Middletown, Pa.—Burgess C. B. Erisman has recommended purchase of steam fire engine.

Titusville, Pa.—Borough will purchase 1,000 ft. of fire hose.—H. H. Holstein, Borough Engineer.

Williamsport, Pa.—Council is considering ordinance authorizing purchase of 1,000 ft. of hose.

Tyler, Tex.—Purchase of combination fire wagon is being considered.—J. J. Daglish, Fire Chief.

Weatherford, Tex.—Citizens have voted $15,000 bonds for fire station and city hall.

St. Johnsbury, Vt.—Purchase of chemical engine, ladder truck and other apparatus is being considered.

Cheney, Wash.—Council is considering purchase of double 45-gal. tank chemical engine.

Tacoma, Wash.—Fire and Water Committee is considering erection of frame engine house on St. Paul ave.

CONTRACTS AWARDED

Baltimore, Md.—Fire boat to Skinner Ship Building & Drydock Co., $110,000.

Salisbury, Md.—Fire alarm system to Diamond State Telephone Co.

Bordentown, N. J.—Fire house, to C. H. Fennimore, $2,978.

Hazleton, Pa.—500 ft. of hose, to Eureka Hose Co., New York, $1.10 per ft.

BIDS RECEIVED

Peoria, Ill.—Three thousand feet of hose: Manhattan Rubber Co., Chicago, Columbia; double-jacket, $1 per ft.; Liberty, double-jacket, 85c.; Superb, multiple woven, 95c.; Bi-Lateral Fire Hose Co., Chicago, Winoka $1; Triumph, $1; Boston Belting Co., Chicago, Imperial, woven jacket, 80c.; Phoenix, woven jacket, 65c.; twilled single body, 62c.; the C. C. C. Fire Hose Co., Canton Junction, Minn., C. C. C. knit, double jacket, 85c; Eureka Fire Hose Mfg. Co., Chicago, Paragon woven, $1.10; Monitor Jacket, $1; Surprise, knit jacket, 90c.; Peerless jacket, 90c.; Manufacturers' Sales Co., city, Babcock Special, 97c.; Babcock, 82c.; Calvage, 77c.; N. J. Carr Spring & Rubber Co., Chicago, Edison, solid woven, $1; Universal, heavy double jacket, $1; Metropolitan, double jacket, 90c.; Chicago Fire Hose Co., Chicago, National jacket, $1; Islewood jacket, $90c.; Superior jacket, 85c.; Defiance, $1; Boston Woven Hose & Rubber Co., Cambridge, Mass., Duplex Imperial, 76c.; rubber, knit jacket, 74c.; middle set standard, 69c.; Quaker City Rubber Co., Chicago, 3-ply Quaker City solid woven, 85c.; Pometus, double jacket, 70c.; Gutta Percha & Rubber Co., Chicago, Baker fabric, $1; Princeton, 95c.; Ajax, 90c.; Rescue, 85c.; New York Belting & Packing Co., Chicago, Concord, 75c.; Signal, 90c.; Keystone, $1; Voorhees Rubber Mfg. Co., New York, Power, $1; Kearney, 90c.; Fire Model, 85c.; Overall, $1.10, and Multiple Woven Hose & Rubber Co., Worcester, Mass., Bi-Moore, 95c.

Tacoma, Wash.—Twenty-five fire alarm boxes, Gamewell Fire Alarm Co., only bidder, two styles of boxes, $3,100 and $2,500.

ELECTRIC RAILWAYS

Gadsden, Ala.—Council will be asked to grant franchise to Noccalula and Southwestern Railroad Co., which proposes to build interurban line from this city to Ulalla via Alabama City and Noccadula Falls. Louis Hart is interested.

Gadsden, Ala.—Out-of-town capitalists are preparing to build street car line to top of Lookout Mountain; application for franchise will be soon made.

Van Buren, Ark.—Fort Smith Light and Traction Co., Fort Smith, has applied for franchise to build new lines over certain streets.

Easton, Cal.—Hall C. Ross has applied for franchise to build electric railway.

Oakland, Cal.—Santa Fé Railroad Co. will ask Council for electric street railway franchise.

San Francisco, Cal.—San Francisco Suburban Improvement Co., capital $500,000, is considering construction of line to reach Upper Sunset district.

Bremen, Ind.—Omar E. Neff, of Milford, Ind., is interested in project to build electric line from this city to Mishawaka.

Evansville, Ind.—Business men of Lynnville, Ind., have organized for purpose of getting a traction line for town.

Hammond, Ind.—Hammond, Whiting and East Chicago Electric Railway Co. will build extension between this city and Harvey, Ill.—A. L. Drum & Co., 125 Monroe st., Chicago, Ill., Engineers.

Charles City, Ia.—C. C. Hart, Charles City, is interested in the construction of electric line to Webster City via Dows City and Hampton.

Oswego, Kan.—Oswego, Columbus and Cherryville Electric Railway Co. has been incorporated to build 47-mile electric railway from Columbus to Cherryvale; capital stock $50,000.—S. B. Miller, Oswego; D. Christman, W. J. Jones and G. Torbert, Altamont; I. M. Hinds, Moundw Valley; David Dunbar, Hallowell; C. A. Mitchell, Cherryvale, and T. F. Stice, Oswego, Incorporators.

Topeka, Kan.—Union Traction Co. will extend line from Montgomery County tarough Labette, Allen and Neosho counties; $150,000 bonds will be issued for improvements.—J. H. Dana, Coffeyville, Attorney.

Oakland, Md.—Garrett County Railway will be chartered to build electric railway from Oakland to Mountain Lake Park, Deer Park, Accident, Grantsville and Frostburg, Md., with branches from Accident to Friendsville, and from Grantsville to the Pennsylvania State boundary.—G. J. Gugey, Henry M. Speicher, George Padgett, W. Ravenscroft and Charles Lighthiser, Incorporators.

Hibbing, Minn.—W. N. Brown is planning construction of street car line to village of Alice; cost $40,000.

Billings, Mont.—Eastern Montana Electric Railway will secure right-of-way upon completion of survey; railway will be 87½ miles long.—F. A. Kesselhuth, city, Chief Engineer.

Virginia, Mont.—Virginia City Southern Electric Railway, Virginia City, has applied for charter to build electric railway from Ruby Valley branch of the Northern Pacific Railway via Ruby, Junction, Adobetown and Nevada to Virginia City, distance 12 miles; also from Virginia City via Ennis up the Madison Valley to Lyon; capital stock, authorized, $200,000.—Luther H. Leber, New York, N. Y.; A. J. Bennett, Karl Elling, W. A. Clark and George E. Gohn, Virginia City, Incorporators.

Whitefish, Mont.—Citizens have voted to grant francaise to Whitefish-Poison Electric Railway to construct line through town.

Trenton, N. J.—Governor Fort has vetoed bill of Assemblyman Pikaart, North Paterson, to revive franchise of State Line Traction Co., which has passed into control of the Public Service Corporation.

Bolivar, N. Y.—Southwestern New York Traction Co. has been incorporated to build 20-mile electric railway from Bolivar to Wellsville; capital stock $200,000.—Charles M. Van Curen and Albert J. Matson, Bolivar; Benjamin F. Patterson, New York, and James G. Pugh, Baltimore, Md., Directors.

Brooklyn, N. Y.—City and Suburban Railway has been incorporated to build 23,-mile electric railway in Kings, Queens and Nassau counties from Ridgewood Reservoir, Brooklyn, to Amityville; capital stock $230,000.—W. H. Buroughs, I. T. Platto, L. C. Neuberger and David H. Cagney, New York, Directors.

Muskogee, Okla.—Electric street car and interurban company, capital $100,000, has been organized. E. W. Mangson and A. J. Barwick, St. Louis, are interested.

Astoria, Ore.—Astoria, Pacific Coast and Southern Railway has applied for a charter to construct electric railway from Astoria to Tillamook; capital stock $500,000.—B. Van Duson, E. E. Gray and J. E. Higgins, Incorporators.

Portland, Ore.—Fairdale, Trask and Tillamook Railway is planning to build electric railway from Fairdale to Tillamook; capital stock $10,000.—R. Haskins, A. B. Wastell and J. H. Gearin, Incorporators.

Slippery Rock, Pa.—Slippery Rock and Grove City Street Railway Co., Grove City, will let contracts April 20 for constructing proposed line from Slippery Rock to Grove City.—H. B. Graves, Butler, Chief Engineer.

Waynesboro, Pa.—Blue Ridge Railway Co. has been formed to build line from Pen-Mar to Blue Ridge Summit.—G. B. Beaver, President.

Mitchell, S. D.—Iowa and Dakota Interurban Railway Co., capital $500,000, has been incorporated to construct electric road from this city to Sioux City, Ia., a distance of 125 miles.

Tooele, Utah.—Tooele Valley Railroad Co. has petitioned Council for extension of one year in which to electrify road to the Salt Lake Route tracks.

Petersburg, Va.—Chesterfield County residents are urging extension of trolley line from this city to Matoaca.

Staunton, Va.—Blue Ridge Lighting and Power Co. will extend street railway.—J. M. Spotts, President.

Middlebourne, W. Va.—Middle Island Railroad is planning to build electric railway from Clarksburg to Salem, Middlebourne, Shirley, Center Point, McElroy Creek and Sistersville; capital stock $5,000.—T. Moore Jackson and C. P. Stout, Clarksburg; L. M. Underwood, John F. Shore and T. P. Hill, city, Incorporators.

St. Thomas, Ont., Can.—City Engineer Bell has advised the ratepayers to vote on improvement to city railway at same time they vote on park improvements.

BRIDGES

Birmingham, Ala.—City and railways plan construction of viaduct over railway tracks to extend on 28th st. from Ave. B to 2d ave., and on 1st ave. from 26th st. to 32d st.; cost $1,000,000; also another viaduct on 12th ave. and 28th st. N. and another subway at 15th ave. and 27th st. N.—Maury Nicholson, City Engineer.

Roseville, Cal.—Trustees are considering erection of bridge across Dry Creek.

Yuba City, Cal.—Preliminary surveys for proposed combination wagon and railroad bridge across Sacramento River at Meridian have been made; Committees of Boards of Supervisors of Sutter and Colusa counties and officials of the Northern Electric Co. are interested.

Washington, D. C.—Construction of bridges over canal within the district by Chesapeake and Ohio Co. is being considered.

Hopedale, Ill.—Bridge will be built across Mackinaw at Waltmire's ford; cost $8,000.

Lockport, Ill.—Sanitary District, Chicago, is preparing plans for movable steel railroad bridge, with 60-ft. span; cost $8,000.—C. R. Hart, 125 Monroe st., Chicago, Engineer.

Peoria, Ill.—Citizens have voted bonds for erection of proposed bridge.

Bedford, Ind.—Bids will soon be received by Lawrence County Board of Commissioners for construction of steel bridge.

Hammond, Ind.—Lake County Council, Crown Point, appropriated $75,000 for construction of bridge over Calumet River, at Hohman st.

Portland, Ind.—Commissioners of Jay and Blackford counties have rejected all bids for the construction of two bridges across Salamonie River.

Richmond, Ind.—Bids will be received by Wayne County Board of Commissioners about May 1 for construction of five steel bridges.—R. A. Howard, County Engineer.

Shenandoah, Ia.—Board of County Commissioners are considering construction of two cement bridges over Johnson Creek.

Fort Scott, Kan.—County Commissioners will soon ask for bids on steel and concrete bridges.

Pittsburg, Kan.—City is considering constructing two steel highway bridges 75 to 100 ft.—L. B. Curfman, City Engineer.

Paris, Ky.—Bourbon County will expend $42,000 in constructing and repairing bridges and rebuilding and repairing roads.

Westminster, Md.—Governor Crothers has signed bill providing for bridge over Lynchester River, this county.

St. Paul, Minn.—Board of County Commissioners will ask Wisconsin Central road to erect concrete bridge on Arcade st.

St. Louis, Mo.—Bids will be received by Board of Public Improvements about April 25 for construction of the Kingshighway viaduct, at Kingshighway blvd.—O. W. Childs, City Engineer.

Union, Mo.—Surveys have been made by County Highway Engineer for bridge location on Bourboise, south of town.

Butte City, Mont.—Plans have been accepted for Northern Pacific Railway viaduct over Harrison ave.; cost $16,000.

Fremont, Neb.—Merrick County Board has appropriated $4,000 towards erection of bridge across the Platte River at Havens.

Elizabeth, N. J.—Board of Freeholders is considering building number of small bridges.

Jersey City, N. J.—Street and Water Board has asked for $9,250 for repairing viaducts.

Fulton, N. Y.—Syracuse, Lakeshore and Northern Railway will construct bridge.

New York, N. Y.—Drawings of proposed land approaches to Manhattan Bridge, at the intersection of Canal st. and the Bowery, to be built at estimated cost of $700,000, have been approved by Municipal Art Commission.

South Wales, N. Y.—Town has voted to build bridge over Cazenovia Creek.

Moorhead, N. D.—City is considering erection of suspension bridge in park.—A. M. Hopman, City Engineer.

Williston, N. D.—Plans and specifications are being prepared for bridge to cross C Canal.

Canton, O.—Stark and Mahoning County Commissioners are considering proposed enlargement of Mahoning ave. bridge; cost $1,000.

Cincinnati, O.—County Engineer has estimated cost of drawbridge over canal on Compton rd. at $3,370.

Cleveland, O.—City Engineer Hoffman will prepare estimate of cost of replacing present bridge over Big Creek.

Piqua, O.—Plans are being prepared by County Engineer H. E. Whitlock, Troy, for bridge over Miami River; bids will be received about May 1.—Joseph Sinks, County Auditor.

Troy, O.—Plans are being prepared by County Engineer H. E. Whitlock for bridge, with two steel spans, 140 ft. each, concrete abutments and piers over Miami River; bids will be received about May 1.—Joseph Sinks, County Auditor.

Muskogee, Okla.—County Commissioners will receive bids at once for erection of two concrete bridges.

Okmulgee, Okla.—This city will construct steel bridge.—T. J. Embree, City Engineer.

Seaside, Ore.—County Commissioners have been petitioned for construction of bridge across Necanicum.

Carbondale, Pa.—Mayor A. L. Sabin has recommended erection of viaduct to west side and overhead bridge at Dundoff railroad crossing.

Titusville, Pa.—Borough will construct small concrete bridge.—H. H. Holstein, Borough Engineer.

Wilkes-Barre, Pa.—Plans are being prepared by Schofield Engineering Co., Arcade Bldg., for 9-span bridge, 2,600 ft. long, over Susquehanna River, for Lucerne County Board of Commissioners; cost $225,-000.

Greenville, S. C.—Citizens have voted $200,000 bonds for construction of bridge across Reedy River and street and sidewalk paving.

Morristown, Tenn.—Hamblen and Cocke counties have voted $3,000 each for construction of bridge at Inman's Ferry.

Brady, Tex.—Commissioners' Court will again call election of bonds for erection of three bridges across San Sata and two across Colorado river.

Cleburne, Tex.—Johnson County Board of Commissioners is considering constructing low bridge.—D. G. Dalton, County Engineer.

Dallas, Tex.—Dallas County has voted $600,000 bonds for construction of viaduct and bridges mentioned at various times.

Greenville, Tex.—Hunt County Board of Commissioners is considering construction of two or three steel bridges, about 40 ft. spans.—J. A. Mattox, County Auditor.

Tyler, Tex.—City has decided to construct one concrete culvert.—W. E. Burgess, Mayor.

Tacoma, Wash.—City Engineer W. C. Raleigh is urging erection of temporary bridge over gulch on Tacoma ave.; cost $11,000.

Brantford, Ont., Can.—Citizens have passed by-law to raise $50,000 to construct South Market bridge.

CONTRACTS AWARDED

Talladega, Ala.—Bridge at Jackson's Shoals, to Roanoke Bridge Co., $4,250.

Indianapolis, Ind.—Bridge over Bean Creek for Beech Grove Traction Co., to John McGreggor.

Richmond, Ind.—Bridge construction. Middleboro arch, to Isaac Smith, $3,690 and 45c. per yd. for earth fill, 80c. per yd. for gravel fill; Pan-American, Murray extension, $620; Weaver, steel, $1,547, Weaver, concrete, $439, fills 26¾c. per cu. yd.

St. Paul, Minn.—Concrete bridge, to F. J. Romer, $11,838.

Biloxi, Miss.—Kibbe bridge over Bayou Bernard, to Vincennes Bridge Co., $2,150.

Fremont, Neb.—Steel spans for Platte River bridge, to Standard Bridge Co., of Omaha.

Grand Island, Neb.—Building county bridges, one year, to Standard Bridge Co., Omaha.

Waynesburg, Pa.—Bridge across Clawson Run, to Edward Mankey, Morris Township, $900; bridge across Webster Run, Jackson Township, superstructure, to C. I. Lantz, $407; to William Stewart and Charles Frye, substructure, $3.20 per perch; superstructure for bridge across Muddy Creek, Cumberland Township, to Nelson Merydith Co., $1,421; to Edward Mackey, for substructure, $3.99 per perch.

BIDS RECEIVED

Los Angeles, Cal.—Reinforced concrete bridge on Eagle Rock road: J. T. Hall-Marvin Co., $19,700; William F. Bixby, $10,965; Mercereau Bridge & Construction Co., $11,250; Peterson & Schmidt, $11,500; California Ornamental Brick Co., $12,626; W. A. Dontauville, $14,470.

Syracuse, N. Y.—Reinforced concrete arched bridge over Onondaga creek at Dickerson st.: Samuel Bonn, low bidder at $6,560.75; C. J. Sullivan, $8,055.25; Frank S. Sposato, $9,451; C. T. Hookway, $7,111.40; H. S. Moore, $10,999.70; John Young, $7,886.50; Walter Bradley, $8,280.50; Wells, Boughton & Co., $9,299.80.

MISCELLANEOUS

Eufaula, Ala.—City will at once purchase street sprinkler.

Gadsden, Ala.—Council is considering use of dust-laying preparation on streets.

Hot Springs, Ark.—City has approved plans for $20,000 library.

Oakland, Cal.—Assistant City Engineer P. F. Brown has prepared first plans and specifications for construction of concrete seawall between Myrtle st. and Broadway, on water front.

San Francisco, Cal.—Park Commissioners will need $600,000 to carry out plans of construction and maintenance of grounds during coming year.

Grand Junction, Col.—Plans have been prepared by W. W. Pearce, Boulder, for improvement of Ute st. park.

Key West, Fla.—Key West Progressive Association will purchase site for city park. Dr. J. B. Maloney is interested.

Atlanta, Ga.—City is considering erection of $22,000 public comfort station; plans by Haralson Bleckley.—R. M. Clayton, City Engineer.

Atlanta, Ga.—Finance Committee has been instructed to purchase playground outfits for seven parks.

Bloomington, Ill.—City is considering erection of palm house.

Canton, Ill.—City Engineer Carl Beam has recommended that steps be taken toward placing street names in streets of city.

Fort Wayne, Ind.—Board of Safety will ask Council to purchase motorcycle and an auto runabout for use of police department.

Ellsworth, Kan.—Town is raising $1,200 fund for purchase of public library site.

Hutchinson, Kan.—Citizens have defeated proposition to issue $40,000 bonds to purchase tract of 165 acres for public park.

Hagerstown, Md.—Plans by Architect Jas. H. Ritchie, 110 State st., Boston, have been selected for proposed Washington County Hospital. Edw. W. Mealey is interested.

Boston, Mass.—Council is considering orders providing for loan of $10,000 for improvements at Neponset playground; loan of $15,000 for new buildings at McKenzie Beach, also passed loan orders for $27,500 for playground improvements, and $2,500 for loan and planting at Savin Hill Park.

Haverhill, Mass.—Municipal Council is considering establishing another playground in Ward 6.

Lowell, Mass.—Charity Commissioners are considering plan by Mayor Meehan for contagious hospital at City Farm.

Port Huron, Mich.—Civic Improvement Association has petitioned Council asking that pavements be flushed regularly and that streets be kept as free of dust as possible.

Duluth, Minn.—County Commissioners have approved plans for beautification of courthouse grounds as presented and explained by Architect A. H. Morrell.

Kansas City, Mo.—Citizens have voted following bonds: Parks, $700,000; city market, $75,000; levee improvements, $75,000; House of Correction, $50,000; incinerating plants, $200,000; tuberculosis hospital, $50,000; armory, $350,000; art museum, $250,000, and isolation hospital for children, $75,000.

Broken Bow, Neb.—Citizens have voted $15,000 bonds for erection of city hall and fire headquarters.

Paulsboro, N. J.—Council has decided to order street sprinkler.

Auburn, N. Y.—Business men are endeavoring to have all of the streets of the city renumbered.

Bingnamton, N. Y.—State Health Commissioner E. H. Porter has recommended that landscape architect be employed to advise city as to treatment of its river banks; also that city inaugurate municipal system of garbage collection.

Buffalo, N. Y.—Council has authorized Police Department to purchase two auto patrol wagons, cost $6,000; also construction of concrete dock at foot of Main st., cost $10,000.

Buffalo, N. Y.—Council has allowed $29,250 estimate for new buildings at Zoo.

Corning, N. Y.—Special Commission will ask Legislature for power to issue $12,000 bonds for establishment of incinerating plant.—R. H. Canfield, Superintendent of Public Works.

Mt. Vernon, N. Y.—Board of Health has approved proposition submitted to city by Frank Nordone, garbage contractor, to build crematory for incineration of all refuse matter, establishment to be purchased by municipality at expiration of his three-year contract, at appraised valuation.

New York, N. Y.—Municipal Art Commission has approved 17 prints, showing typical designs of local and express subway stations and of elevated stations on proposed Broadway-Lexington ave. subway route.

New York, N. Y.—Board of Estimate has set aside $60,000,000 for subways.

New York, N. Y.—H. Van Buren Magonigle, New York, has been given first prize by Robert Fulton Memorial Association for proposed water gate memorial to Robert Fulton.

Raleigh, N. C.—Sanitary Committee is considering purchase of street car sprinkler.

Salem, N. C.—Citizens are urging purchase of street sprinkler.—F. H. Vogler, Mayor.

Troy, O.—Architect W. Shilling has prepared plans for erection of $17,000 addition to County Jail.—Judge Meyers, Chairman County Commissioners.

Muskogee, Okla.—Citizens have voted bonds for park purposes.

Oklahoma City, Okla.—Citizens have voted $10,000 for installation of police alarm system, $50,000 for park purposes and $15,000 for street cleaning purposes.

McKeesport, Pa.—Mayor H. S. Artaur has recommended organization of City Planning Commission; also improvements and extension of parks and playgrounds.

McKees Rocks, Pa.—Borough will construct a garbage plant.—Geo. H. McGinness, Borough Engineer.

Philadelphia, Pa.—Bids will be received May 16 for proposed $8,000,000 municipal loan.—John Reyburn, Mayor.

Port Vue, Pa.—Council will receive bids at once for street signs to be erected through borough.

Scranton, Pa.—Mayor John Von Bergen, Jr., has recommended public lavatory, public market, hospital for segregation, placing of street signs and broadening of playground and park system.

Fort Worth, Tex.—Citizens have defeated proposition to issue $100,000 bonds for construction of city market and auditorium.

Weatherford, Tex.—Citizens have voted $15,000 bonds for city hall and fire station.

South Boston, Va.—City has accepted plans by Heard & Caldwell, Lynchburg, for $20,000 municipal building.

Keystone, W. Va.—Citizens have voted $28,000 bonds for erection of jail and improvement of water works.

Milwaukee, Wis.—Park Commissioners are considering improvement of Lapham and Gordon Parks and Stern tracts.

Milwaukee, Wis.—Council has adopted resolution directing Board of Public Works to advertise for plans for $250,000 central police station and criminal court building on Broadway.

Milwaukee, Wis.—Council has passed an ordinance to issue $75,000 of bonds for a sanatorium in the Third Ward.—Aug. M. Gawin, City Comptroller.

CONTRACTS AWARDED

Kansas City, Kan.—Shelter house, Shawnee Park, to Peter Van Zele, $4,150.

Boston, Mass.—Resurfacing and grading main portion of Charles River Dam, to Coleman Bros., 15 Court sq., Boston, $28,446; F. D. Davis Co., Boston, $32,170; Luke D. Mullen, Charlestown, Mass., $33,721; W. H. Ellis, 18 Tremont st., Boston, $34,004; T. H. Gill Co., Boston, $34,955; John J. Farley, Somerville, $35,605; McCarthy & Walsh, East Boston, $37,479; William L. Miller, 19 Milk st., Boston, $42,025.

Rochester, N. Y.—Cleaning streets, group 1, to C. W. Hartung, $2,086.60; group 2, to C. W. Hartung, $1,453.50; group 3, to F. G. Houser, $1,839.40, by petition; group 4, to C. W. Hartung, $663; group 7, to August Kimmel, $1,894.48; group 8, to G. E. Bantel & Son, $1,283.50; group 9, to August Kimmel, $263.50; group 10, to E. E. Yeoman, $421.60; group 11, to E. E. Yeoman, $1,547.

Dayton, O.—Sprinkling, 68 streets to Wm. Turner, 36 to F. W. Kramer, 6 to W. T. Yokum and 17 to M. W. Hartnett.

Philadelphia, Pa.—Dredging plant, to Elliott Construction Co., Baltimore, $90,000.

Pittsburg, Pa.—Garbage and rubbish, old city contract, to American Reduction Co., $188,500; North Side, to Allegheny Garbage Co., $65,000.

Scranton, Pa.—Street sprinklers, 600 gals., to Lawrence Machinery and Supply Co., Philadelphia, Pa., $302.

York, Pa.—Garbage collecting, to D. G. Klinedinst, $25 per month.

Stamford, Tex.—Construct police flashlight system, the Dean Electric Co., Elyria, O.

Portsmouth, Va.—Construction of City Clerk's office, to J. W. Davis, $16,991.60.

Milwaukee, Wis.—Boathouse, bridge and landing, Humboldt Park, to S. Holverson, $9,200.

BIDS RECEIVED

Indianapolis, Ind.—Sprinkling unimproved streets: District No. 1, 11,238,051 sq. ft.; Gemmer & Henry, $17.60, former bid, $23.90; Frank Kennington, $22, former bid, $25, and William Ratican, of St. Louis, $22.08, with a former bid of $22.90. District No. 2, 7,400,031 sq. ft.: Gemmer & Henry, $17.60, former bid, $22.70; Frank Kennington, $18.20, former bid, $22, and William Ratican, of St. Louis, $21.30, with a former bid of $21.40.

Columbus, O.—Excavation, grading and draining for elimination of crossing of the Hocking Valley R. R. at State st., Broad st., Town st. and Rich st.; W. H. Luchtenberg, lowest bidder, $65,000.

Scranton, Pa.—Supplying street sweepers and sprinklers: Studebaker Bro., New York, for two 250-gal. wooden tank sprinklers, $270 each; steel tanks, $300 each; sweeping machines, $240 each; Lawrence Machinery & Supply Co., Philadelphia, for 600-gal. steel tank sprinkler, $302 each; sweeping machines, $262.50 each; Penn Sales Co., city, sprinklers, $355 each, with farm gear, $269; $44 extra for steel tanks; sweeping machines, $260 each.

TOO LATE FOR CLASSIFICATION

STREET IMPROVEMENTS

Colorado Springs, Col.—Bids will be received April 23, noon, for constructing driveway; distance 75 mi.—C. W. Comstock, Denver, State Engineer.

Jacksonville, Fla.—Bids will be received May 2, 3 P. M., for grading and laying hexagonal tile sidewalks with concrete curbing.—H. G. Aird, Chairman, Board of Public Works.

East St. Louis, Ill.—Bids will be received Apr. 27, noon, for 2710 sq. yds. vit. brick paving on 6-in. concrete base, 750 cu. yds. excav. removed and 1100 lin. ft. 2-in. x 12-in. oak curb; improvement of twelve or fifteen streets considered.—J. F. Parr, Assistant City Engineer.

Bloomington, Ind.—Bids will be received May 4, 2 P. M., for constructing pike in Bloomington Township.—Horace Blakely, Auditor, Monroe County.

Des Moines, Ia.—Committee has decided to improve Beaver st. with vitrified brick.

Berlin, Md.—City will expend $10,000 on street improvements.

Lynn, Mass.—Bids will be received Apr. 26, 5 P. M., for laying 10,000 sq. yds. paving.—C. H. Ramsdell, Chairman, Board of Public Works.

Boonton, N. J.—City has sold $14,000 street improvement bonds.

Buffalo, N. Y.—Bids will be received Apr. 27, 11 A. M., for paving and repairing various streets.—F. G. Ward, Commissioner of Public Works.

Whiteville, N. C.—Bids will be received May 16 for $10,000 street improvement bonds.—W. E. McDaniel, Town Clerk.

Esmond, N. D.—Bids will be received Apr. 30, noon, for construction of grade between Sec. 2 and 11.—L. M. Harwood, Clerk, Impart Township.

Maurel, N. D.—Bids will be received May 2, 2 P. M., for grading and regrading 6 mi. of road.—C. E. Colosky, Clerk, Ferry Township.

Walcott, N. D.—Bids will be received Apr. 23, 2 P. M., for construction of road grading of from 1½ to 2 miles in length.—J. R. Johnson, Clerk, Board of Supervisors.

Canton, O.—Bids will be received May 2, 10 A. M., for draining, grading and paving with brick 1.55 mi. of road; cost $34,357.20.—J. H. McConnell, County Auditor.

Cleveland, O.—Bids will be received May 4, 11 A. M., for furnishing material and repairing various roads.—J. F. Goldenbogen, Clerk, Cuyahoga County Commissioners.

Oberlin, O.—Bids will be received Apr. 23, noon, for macadamizing E. College St.—H. T. Marsh, Village Clerk.

Portsmouth, O.—Bids will be received May 3 for $14,000 street improvement bonds.—W. N. Gableman, City Auditor.

Ravenna, O.—Bids will be received Apr. 25, noon, for grading, curbing and paving Bowery st.—E. W. Marvin, Village Clerk.

Springfield, O.—Council has decided to improve McCreight Ave.

Clinton, Okla.—Bids will be received May 3, 8 P. M., for about 67,000 sq. yds. asphalt paving on 5-in. concrete base; 20,000 lin. ft. concrete curb and gutter combined, 5,000 ft. of concrete curb and 5,000 ft. of concrete gutter.—J. L. O'Hearn, City Engineer.

Mt. Carmel, Pa.—Bids will be received May 2, 7:30 P. M., for about 15,000 yds. brick street paving.—John Carl, Jr., Secretary of Borough.

North Braddock, Pa.—Bids will be received Apr. 29, 3 P. M., for improvement of Benton st.—C. A. Stewart, Borough Engineer.

Uniontown, Pa.—Bids will be received Apr. 20, 2 P. M., for improving portions of State roads.—J. W. Hunter, Harrisburg, State Highway Commissioner.

Woonsocket, R. I.—Board of Aldermen has appropriated $5,000 for paving and $400 for concreting.

Redfield, S. D.—Bids will be received May 14, noon, for grading 8 mi. of roads.—A. W. Young, Town Clerk.

Houston, Tex.—Citizens have petitioned for paving of four streets in Jas. Bute addition with gravel or ?

Tacoma, Wash.—Council has passed ordinance for improvement of Tacoma ave.

Janesville, Wis.—Bids will be received May 10, 2 P. M., for improving South Main, Second and Third sts.—W. F. Carle, Chairman, Street Assessment Committee.

Superior, Wis.—Bids will be received Apr. 22, 2 P. M., for grading, curbing and repairing John Ave.—G. E. Rolph, Chairman, Board of Public Works.

Hamilton, Ont., Can.—Works Committee has decided to expend $28,000 for street improvements.

CONTRACTS AWARDED.

Washington, D. C.—36,000 cu. yd. grading, bids opened April 9, to Geo. Hyman, city, 23½c. per cu. yd.—C. B. Hunt, Engineer of Highways.

Clarinda, Ia.—Paving to Thos. McLaughlin & Son: 13,500 ft. of paving and curbing, $1.30 and 6,500 ft. of alley paving, $1.34; Barron and Sweatt, Boone, Ia., $1.60 and $1.64; Dunnigen & Carr, Shenandoah, $1.32 and $1.39; Thos. Shank, Red Oak, $1.32, paving: A. Kormian, Clinton, $1.40 and $1.47; Miracle Concrete Co., Des Moines, $1.36, $1.40; Thos. Carr & Sons, $1.363, $1.39; setting 4,560 ft. new curb to same firm, 35c.; Barron and Sweatt, 40c.; Dunnigen & Carr, 40c.; Thos. Shank, 39c.; A. Kormian, 38c.; Thos. Carr & Sons, 38c.; and Miracle Concrete Co., 35c.—C. W. Stuart, City Clerk.

Perry, Ia.—Bitulithic pavement, 2-in. wearing surface on 5-in. concrete base to Wm. Horrabin, Iowa City; 5,000 cu. yds. grading, 40c.; 9,500 curb, 69c.; 20,600 sq. yds. pavement, $2.08½ and overhaul, .02½c.; creosoted wood block pavement to same bidder; 11,455 cu. yds. grading, 40c.; 18,850 ft. curb, 46½c.; 33,700 sq. yds. pavement, $2.25, and overhaul $.02.—Chas. Wilson, City Engineer.

Topeka, Kan.—Paving S. Lawrence Ave., 11,905 sq. yds. to Kansas Bitulithic Co., Kansas City, Mo.

Fremont, Mich.—Paving Main and Stewart sts. to Kloote & Vander Veen, Grand Rapids, $23,502.

Amsterdam, N. Y.—Paving E. Main st., bids opened April 5, to M. F. Dollard, Albany, $2.27 per sq. yd.; total cost, $17,155.

Cincinnati, O.—Repair of south fork of Taylor Creek road to Alfred Deckbach, $11,643.

Aberdeen, Wash.—Sidewalks, 6670 sq. yds. to Aberdeen Construction Co., $1.05; other bidders: Keasal Construction Co., Tacoma, $7,670.50; Hautrel & Hegdale, $7,603.80; and Coast Contracting Co., Tacoma, $7,337.—C. W. Ewart, City Engineer.

BIDS RECEIVED

Aberdeen, Wash.—Asphalt paving, 15,000 sq. yds., Barber Asphalt Co., $2.15 per sq. yd., maint., 5 yrs., 2c. per yd.; sub-grading, total $32,250: Keasal Construction Co., Tacoma, $35,700; concrete pavement, Coast Construction Co., $28,350 and Blome Construction Co., $35,850; new curbing, 3870 lin. ft., 1-3-6 concrete, and 320 lin. ft. 1-3-6 concrete, Wainwright, 75c., Barber Asphalt Co., total $1788; Keasal, $1,530.50; Coast, $1,401, and Blome, $1,885.70; Steel bound concrete on corners.—C. W. Ewart, City Engineer.

SEWERAGE

Stuttgart, Ark.—Bids will be received Apr. 25, 9 A. M., for construction of sewer system and sewage specification work.—W. S. Shields Co., 1201 Hartford Bldg., Engineers; R. B. Gregg, Secretary Board of Public Improvements.

Los Gatos, Cal.—Construction of sewer on San Jose st. is being considered.—Robert Chandler, City Engineer.

Decatur, Ill.—City Engineer A. B. Alexander has made survey for sewer for block bounded by Main, Church and William sts. and Prairie ave.

Boston, Mass.—Mayor Fitzgerald has signed loan order for $674,000 for extension of surface drainage on water shed of Charles River basin.

New Bedford, Mass.—Committee on Cities has reported bill authorizing city to borrow $1,600,000 for sewerage purposes.

Alliance, Neb.—Bids will be received Apr. 25, noon, for construction of lateral sanitary sewers in number of streets.—F. W. Irish, City Clerk.

Kearney, Neb.—Council has ordered establishment of sewer district No. 43½.—G. E. Ford, City Clerk.

Defiance, O.—City Engineer has submitted two estimates for cost of proposed Washington st. sewer extension, one costing $1,396.25, not including laterals, another, $345.80.

Clinton, Okla.—Bids will be received May 3 for construction of stone sewers.—C. G. Welsh, Mayor.

Jackson, Tenn.—Bids will be received May 3, noon, for following sanitary sewer work: 1,530 lin. ft. of 16-in. c.-i. pipe, leaded joints, 192 lin. ft. 6-in. c.-i. pipe, leaded joints, 16 6-in. one-eighth c.-i. bends, 7,744 lin. ft. 6-in terra cotta pipe, 16,428 lin. ft. 12-in. and 2,002 lin. ft. 15-in. double strength terra cott apipe, 45 6 x 15-in. Y's, 45 6 x 12-in. Y's and 510 6 x 8-in. Y's, all terra cotta; 593 6-in. one-eighth terra cotta bends, 102 brick manholes with special design c.-i. covers, 8 single 8-in. flush tanks and 2 double 8-in. flush tanks; depth of sewer ditch will vary from 5 to 12 ft.—Atwell Thompson, City Engineer.

WATER SUPPLY

Modesto, Cal.—Town has voted municipal ownership of pumping plant.

Sacramento, Cal.—City Trustees are planning to call another election on $660,000 bonds for clear water; Board has adopted plans for filtration plant drawn by Professor Charles Gilman Hyde, estimating cost of the plant, together with purchase of site, additional pumping unit, etc., at $666,000.

Galesburg, Ill.—Council has passed ordinance providing for $25,000 bond issue for improvement of water service.

Russell, Kan.—Bids will be received Apr. 22, 7 P. M., for construction of concrete dam for water works.—Burns & McDonnell, Scarritt Bldg., Kansas City, Mo., Engineers; H. A. Dawson, City Clerk.

Baltimore, Md.—Board of Awards has approved specifications for pumping station for new pipe line on South st.; with all the machinery, exclusive of the pumps, which have already been contracted for, cost will be about $1.5,000.

Lynn, Mass.—Bids will be received Apr. 25, 5 P. M., for 40 hydrants, 6-in. and 8-in. hub or bell connections open to right; 60 valves, sizes from 4 in. to 16 in., hub or bell connections and 300 water meters.—D. A. Sutherland, Clerk Public Water Board.

Pittsfield, Mass.—Water Committee has recommended building of reservoir on headwaters of Mill Brook, with a capacity of 270,000,000 gal.; cost, $250,000.

Grand Rapids, Mich.—Citizens have voted to construct filtration plant.—Jas. Schriver, City Clerk.

Hancock, Mich.—Bids will be received May 2, 4 P. M., for construction of rein. concrete reservoir, cap. 1,000,000 gals.—A. F. MacDonald, City Clerk.

Perry, N. Y.—Village proposes to install new pump at the water works.—C. C. Hopkins, Rome, Engineer. O. N. Bolton, Village Clerk.

Westbury, L. I., N. Y.—Citizens are considering establishment of water district; proposed plant will include two pumps, two 30-hp. engines, pump house, elevated steel tower, a tank with a capacity of 100,000 gals., 6 miles of mains and 70 hydrants. Cost about $45,000.—Henry Hicks, Chairman Water Committee.

Youngstown, N. Y.—Bids will be received Apr. 29, 8 P. M., for constructing system of water works.—J. F. Witmer, Chapin Block, Buffalo, Engineer; Chas. Taylor, Village Clerk.

Bellaire, O.—Council has given Directors of Public Service power to purchase supplies for water works department.

Clarksburg, W. Va.—City will purchase site near the Monticello Brick Company for purpose of erecting a filtration plant.

LIGHTING AND POWER

Pasadena, Cal.—City is considering plans for lighting parks with tungsten lamps; plat showing number and kind necessary and cost of installing has been prepared by Superintendent C. W. Koiner.

South Pasadena, Cal.—Trustee Volcher, Chairman Street and Light Committee, has recommended municipal lighting plant.

Plateau City, Colo.—J. W. Swift, Palisades, is interested in construction of electric power and lighting plant.

Millsboro, Del.—Feasibility of lighting town with electricity is being considered.

Ocala, Fla.—City proposes to install two 200-hp. boilers at electric light plant.—E. C. Bennett, Superintendent.

Cartersville, Ga.—Council has appointed committee to make investigations in regard to making extensions to municipal electric light plant.—Paul Gilbreath, Mayor.

Bluffs, Ill.—Electric Light, Power & Heating Co., of Bluffs, has been incorporated, capital, $5,000, to operate electric light, power, steam, refrigerating and other plants.—Fred. D. Brockhouse and F. C. Funk, incorporators.

Eagle Grove, Ia.—Citizens' Heat, Light & Power Co. has decided to build brick addition to its plant.

Baltimore, Md.—Bids will be received Apr. 27, 11 A. M., for electric current for all city buildings; supplying illuminating gas for street lamps and public buildings and for electric street lighting.—E. D. Preston; Inspector of Buildings.

Berlin, Md.—Council has decided to extend electric light and water improvements.

New Ulm, Minn.—Bids will be received Apr. 26, 5 P. M., for furnishing and delivering material, for erecting and covering street lamps and for other improvements.—Ernst Wicherski, City Clerk.

Spring Valley, Minn.—W. P. Pulford, of Sioux Rapids, Ia., is considering purchase of electric light plant and installation of new system.

Lidgerwood, N. D.—Establishment of downtown lighting system is being considered by business men.

New Concord, O.—Bids will be received June 11 for construction of electric light plant; cost $15,000.—S. S. Wyer, Harrison Bldg., Columbus, has prepared plans.

Union, Ore.—L. C. Kelsey, 402 Dooly Bldg., Salt Lake City, Utah, has been employed to design and superintend construction of hydroelectric and water works system; cost $60,000.

Woonsocket, R. I.—Woonsocket Gas Co. has asked for permission to extend mains on 16 streets.

FIRE EQUIPMENT

Nahant, Mass.—Committee on Fire Department has decided to purchase Knox auto fire truck; purchase of another auto at later date is being considered.

Pawtucket, R. I.—Council has passed ordinance appropriating $11,775 for motor-driven engine and truck for Fire Department.

CONTRACT AWARDED

Bethlehem, Pa.—Fire hose, 300 ft., Sphinx brand, represented by J. S. Krause & Co., 80c. per ft.; 300 ft. Calypso brand, represented by Mr. Keim, 80c., and 300 ft. Paramount brand of Boston Woven Hose Co., 80c.

ELECTRIC RAILWAYS

Fernandina, Fla.—Council has passed ordinance granting certain rights of way and other rights and franchises to Florida Railway Co.

Columbus, Kan.—Oswego, Columbus & Cherryvale Electric Ry. Co. has been incorporated to build a 47-mile electric railway from Columbus to Cherryvale; capital, $50,000.—S. B. Miller, Oswego; D. Christman, W. J. Jones and G. Torbet, Altamont, and others, incorporators.

McComb City, Miss.—W. M. White and J. J. White, Jr., have been granted a franchise to build street railway.

Kansas City, Mo.—Council has passed four ordinances changing street car lines and extending tracks.

Lebanon, Pa.—Reading Transit Co., Harry G. Louser, city, president, will rebuild Lebanon & Annville street railway, five miles in all.

Selinsgrove, Pa.—Sunbury & Freeburg Street Ry. Co. has completed surveys between this city and Freeburg, 15 miles; work will be commenced on line this summer.—W. H. Lyons, Sunbury, President.

Morgantown, W. Va.—County Court has granted to Harry R. Warfield, his heirs and assigns, franchise for construction and operation of an electric railway from Morgantown by way of Dellslow, thence to West Virginia-Pennsylvania boundary line near Point Marion.

BRIDGES

Fort Morgan, Col.—Bids will be received Apr. 30, noon, for erection of pile trestle bridge over Platte River near this city, and concrete steel bridge over South Platte River near London Junction.—C. W. Comstock, Denver, State Engineer.

Barrington, Ill.—Bids will be received Apr. 26, 10 A. M., for construction of steel bridge.—J. F. Greske, Town Clerk.

Scipio, Ind.—Bids will be received May 2, 1 P. M., for erection of stone arch bridge over Wyalossing creek.—T. L. Thomas, Vernon, County Auditor.

Great Bend, Kan.—Citizens will vote May 24 on erection of three bridges across Arkansas River.

Topeka, Kan.—Shawnee County Board of Commissioners is considering calling bond election to reconstruct Grantville Kaw River bridge.

Cincinnati, O.—Bids will be received May 6, noon, for construction of concrete culvert on Zigzag road.—Fred Dreihs, Clerk, Board of Hamilton County Commissioners.

Monaca, Pa.—Beaver County Commissioners have decided to expend about $8,000 on improving Ohio River Bridge between Rochester and this city.

Fort Worth, Tex.—Commissioner Maddox has recommended another viaduct to connect Lipscomb st. with Lamar.

Wausau, Wis.—Northwestern has agreed to construct viaduct across its right of way at intersection of Canal st. and Single ave.

CONTRACTS AWARDED

Los Angeles, Cal.—Concrete bridge at Washington st. to Mercereau Bridge & Constr. Co., Pacific Electric Bldg., $5,440.

Minneapolis, Minn.—Constructing bridges Nos. 1, 3 and 4 on the north shore of Lake Collhoun and south and west shore of lake of the Isles, to Security Bridge Co., city, for about $80,000.—J. A. Ridgway, Secretary Board of Park Commissioners.

Sherlock, Wash.—Constructing bridge over Nisqually River, to Bertelson & Sons, $8,480.

MISCELLANEOUS

Montgomery, Ala.—Committee on Sanitation and the Committee on Lighting have decided to build plant for destruction of garbage and refuse, and in connection with this plant electric light plant in which electricity will be generated from steam made by burning of refuse.

Los Angeles, Cal.—Council's Finance Committee has decided to recommend that Council appropriate $1,000 to be used in converting quarters recently vacated by receiving hospital at police station into quarters for prisoners.

Wilmington, Del.—Park Board will ask Council for $19,000 for the maintenance of city's public parks the next year.

East St. Louis, Ill.—Bids will be received May 16, noon, for construction of diversion channel for Cahokia Creek; following are estimates: 1,427,900 cu. yds. channel excav.; 60 ft. 30-in. c. i. pipe; 70 cu. yds. rein. concrete; 22 cu. yds. concrete at pipe ends and 2 acres of grubbing.—H. D. Sexton, President, Board of Trustees, East Side Levee and Sanitary District; Jas. F. Parr, Assistant City Engineer.

Fall River, Mass.—City has power to borrow $50,000 for park improvement purposes.

Saratoga Springs, N. Y.—Citizens have voted $250,000 bonds for public parks.

Lorain, O.—Board of Control will soon ask bids for erecting police station and jail.

Memphis, Tenn.—Bids will be received Apr. 26, noon, for furnishing street signs for about 1600 street intersections.—E. H. Crump, Mayor; E. M. Douglass, City Clerk.

Weston, Ont., Can.—Bids will be received by Village Clerk, May 2, 6 p. m., for $57,000 4½ per cent. debentures.—J. H. Taylor, Clerk and Treasurer.

CONTRACTS AWARDED

Topeka, Kan.—Crematory to Lewis & Kitchen, Kansas City, Mo., $16,700.

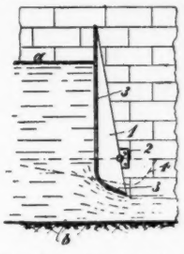
Grand Rapids, Mich.—Constructing short stretch of flood wall between Wealthy ave. bridge and S. Front st. pumping station to Jos. Rusche.

Everett, Wash.—Auto patrol to Oldsmobile Co., $2,800.—F. S. White, local agent.

PATENT CLAIMS

952,725. AUTOMATIC VALVE OR GATE FOR WEIRS OR THE LIKE. Hans Buchler, Zurich, Switzerland, assignor to Stauwerke A. G., Zurich, Switzerland. Serial No. 519,953.

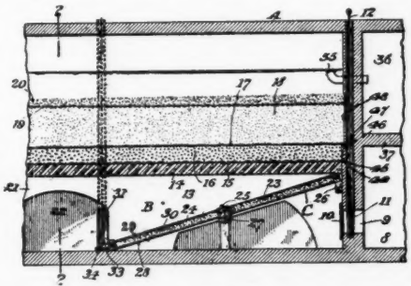
In combination with a dominant pool and a raceway leading therefrom, a valve pivoted to move on a horizontal axis, the



lower end of the valve at all times distant from the bottom of the raceway and being balanced by the upper portion of the valve under all conditions of operation between maximum and minimum water level of the dominant pool, thereby maintaining the quantity of water flowing past said valve substantially constant at all times.

952,842. METHOD FOR PURIFYING WATER. John Roche and Albert Oliver, New York, N. Y., assignors to Oliver-Roche Co., New York, N. Y., a corporation of New York. Serial No. 512,748.

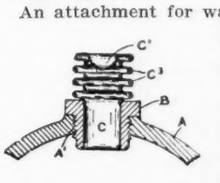
The process of purifying water, which consists in inducing a relatively slow and continuous flow of a body of water through a filtering medium, consisting of porous particles of extensive superficial filtering area, said filtering medium being inter-



posed between a plurality of dissimilar metallic elements and affording a resistance to the flow of electric current therebetween in substantial excess of that of a metallic conductor, and serving to preclude the unimpeded flow of electric current between said electrodes, the said water constituting the electrolyte of a primary battery, whereby said water is subjected to intimate and prolonged contact with the nascent products resulting from the electrolytic decomposition thereof.

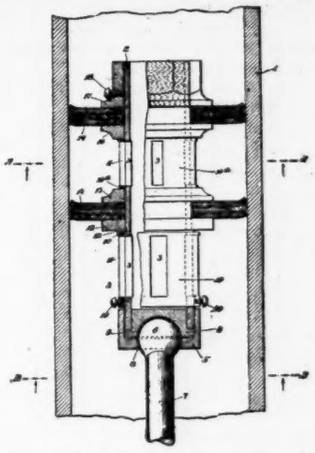
953,199. WATER METER. Ernest E. Gamon, Long Island City, N. Y. Serial No. 478,304.

An attachment for water meters capable of permitting a permanent increase in volume of said water meter under excessive pressure, comprising a hollow insertible plug, and a non-elastic cup-like member having the bottom infolded to reduce the volume of said member but capable of being restored to its original volume, said cup-like member extending outwardly from said plug and being sealed therein by turning the rim of the cup-like member over one end of said plug.



953,666. PIPE-CLEANING DEVICE AND PISTON THEREFOR. Clinton Ingle, Amityville, N. Y., assignor to National Water Main Cleaning Company, a Corporation of Maine. Serial No. 493,090.

1. In a device of the character described,



a hollow shaft closed at one end, flexible rings mounted thereon and openings to permit the water to pass through said shaft.

INCORPORATIONS

Anniston Iron Corporation, Anniston, Ala.; to manufacture cast-iron pipe. Incorporators: H. E. McWane, president; Ernest Williams, vice-president; Lawrence H. McWane, secretary-treasurer, all of Lynchburg, Va.

Central Illinois Electric Company, Buffalo, N. Y.; operate a heat, light and power plant; capital, $2,500. J. E. McCann, C. M. Kimball, Geo. B. Conover, Geo. B. Conover, Buffalo, Ill.

Commonwealth Power Railway & Light Co., Portland, Me.; dealing in stocks, bonds, etc., capital, $12,000,000. Incorporators: A. G. McPherson, A. R. Parsons and W. M. Bradley, all of Portland.

Good Roads Contracting Co., Spokane, Wash., to build country roads; capital, $10,000. Incorporators: J. A. Perry, William H. Cowles, R. Insinger, Daniel Brown, D. W. Twohy, F. W. Dewart and F. H. Mason.

Humble Water, Light & Ice Cream Company, Humble. Capital stock, $12,000. Incorporators: Charles S. Polk, E. L. Cullum, W. E. Sholar.

Hunterdon Electric & Power Company, High Bridge, N. Y.; capital, $12,000; to operate electric light and power plants.

Hydraulic Power Co. of Niagara Falls, Niagara Falls, N. Y.; real estate, etc.; water power, etc.; capital, $500,000. Incorporators: Geo. B. Mathews, Wm. D. Olmstead, both of 233 Chamber of Commerce Bldg., Buffalo, N. Y., and Paul A. Schoelkopf, 706 Main st., Buffalo, N. Y., and four others.

Inland Empire Hassam Paving Co., Spokane, Wash., capital, $10,000. The incorporators are named as Martin Woldson, Daniel G. Munro, Charles E. Swan, W. A. Luey and George M. Ferris. Arthur B. Lee is counsel for the company.

Inland Sewer Pipe Co., Wilmington, Del., Corporation Registry Co.; capital, $300,000. Incorporators: Lewis Minor and W. F. Minor, both of Birmingham, Ala.; Charles W. Bush, Wilmington, Del.

Oklahoma Asphalt, Paint & Roofing Company, of Woodford and Ardmore, Okla.; capital, $35,000. Incorporators: J. E. Parker, T. W. Garbutt and R. A. Hefner, of Ardmore.

The H. B. Van Order Meter Attachment and Protector Co., Ithaca, Tompkins Co., N. Y., manufacture and sell meter attachments and protectors; manufacture and deal in devices for water pipes, etc.; capital, $1,000. Incorporators: Henry B. Van Order, M. A. Van Order, Harry C. Manning, Edwin R. Christman, all of Ithaca, N. Y.

BETTER GOODS FOR LESS MONEY

HEADQUARTERS FOR WATER WORKS SPECIALTIES

GLAUBER COCKS GLAUBER CLEVELAND, O.

SAMPLES AND PRICES FOR THE ASKING

4900 TO 5100 SUPERIOR AVE. CLEVELAND, O.

PROPOSALS

FURNISHING STREET SIGNS

Notice to Bidders

Office of Ennis M. Douglass, City Clerk,
Memphis, Tenn., April 13, 1910.

Notice is hereby given that sealed proposals will be received at the office of the City Clerk, until 12 o'clock noon, April 26, 1910, for furnishing street signs f. o. b. cars Memphis, or at the City Stables in the City of Memphis.

There are approximately 1600 street intersections to be marked.

The bidder will submit samples of signs, brackets and complete fastenings which he proposes to use, as well as the styles of name plates and letters.

The bidder will be required to submit a price on single name plates, on brackets, posts and other fastenings to be used.

A certified check for $250.00 on some solvent bank must accompany each bid. Said check will be returned to the unsuccessful bidders and retained until the successful bidder makes approved bond for the faithful performance of the contract.

The right to reject any and all bids is reserved.

By order of the Board of Commissioners, City of Memphis. E. H. CRUMP,
Mayor.

Attest: ENNIS M. DOUGLASS,
City Clerk.

CEMENT SIDEWALKS

Lake City, Fla.

At 7:30 p. m., April 25th, 1910, the Board of Public Works of the City of Lake City, Fla., will receive bids for approximately five miles of cement sidewalks, per plan and specifications furnished by secretary on application. Certified check for $1,000 must accompany each bid.

SANITARY SEWER WORK

SEALED BIDS will be received by Atwell Thompson, City Engineer, Jackson, Tenn., up to noon May 3, 1910, for the following sanitary sewer work:

1,530 lin. ft. of c.-i. pipe, leaded joints, size 16 in.
192 lin. ft. of 6-in. c.-i. pipe, leaded joints.
16 6-in. one-eighth c.-i. bends.
7,744 lin. ft. of 6-in. terra cotta pipe.
16,428 lin. ft. of 8-in. terra cotta pipe.
2,002 lin. ft. of 12-in. terra cotta pipe.
3,338 lin. ft. of 15-in. double strength terra cotta pipe.
45 6 x 15-in. terra cotta Y's.
45 6 x 12-in. terra Cotta Y's.
510 6 x 8-in. terra cotta Y's.
593 6-in. one-eighth terra cotta bends.
102 brick manholes with special design c.-i. covers.
8 single 8-in. flush tanks.
2 double 8-in. flush tanks.

The average depth of the sewer ditch will vary from 5 to 12 ft.

Plans and specifications may be had by applying to Atwell Thompson, City Engineer, Jackson, Tenn., for the sum of $5.00 each. ATWELL THOMPSON,
(16) City Engineer.

DEBENTURES FOR SALE

Village of Weston, Ontario, Canada.

Sealed Tenders will be received by the Village Clerk up to 6 o'clock p. m., Monday, May 2, 1910, for the purchase of $57,000 4½ per cent 30-year debentures in equal annual payments.

The by-law has been ratified by the Municipal Railway Board of Ontario. The debentures are also guaranteed by the County of York.

For further particulars apply to Higgins & Douglas, Barristers, 140 Yonge st., Toronto, or to J. H. TAYLOR,
R. J. BULL. Clerk and Treasurer,
REEVE. Weston, Ont.

PAVING

Sherman, Tex.

Bids will be received at the office of Barney C. Kreager, City Sec'y, Sherman, Texas, for the following approximate amount of paving proposed by the City of Sherman, bids being requested on brick, rock asphalt, bitulithic, creosoted wood block and petrolithic pavings, and in accordance with plans and specifications now on file:
21,650 sq. yds. street paving.
8,432 lin. ft. curbing (concrete or stone).
491 lin. ft. header (oak or pine).
Bids to be opened May 2d, 1910.

JNO. C. WALL,
Mayor City of Sherman.

BRIDGE

Sherman, Tex.

Bids will be received at the office of Barney C. Kreager, City Secretary, Sherman, Texas, for the construction of a permanent bridge in the City of Sherman, as per specifications as follows:
Minimum Span, 40 ft. in clear.
Minimum Width, 22 ft. in clear.
Live car load, 96,000 lbs.
Live Highway load, 15 Ton Roller.
Concrete Arch or Steel Span with concrete abutments.

Contractors must submit complete plans and specifications covering bridge bid upon. Bids to be opened May 2d, 1910.

JNO. C. WALL,
Mayor City of Sherman.

WANTS

SELLING agents wanted for dustless road process using no oil, tar or grease. Odorless, stainless and easily applied. A liberal commission will be paid to men who can produce results. Address Box 16A, Municipal Journal. (16-17)
Jackson, Tenn.

WANTED—A first-class cement Curb and Gutter and sidewalk finisher. Must be a good man, others need not apply. Must furnish references. P. O. Box No. 625, Oshkosh, Wis.

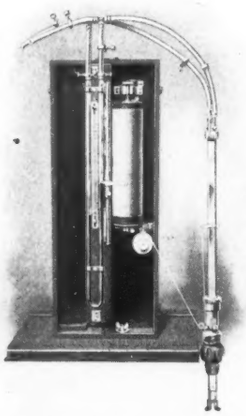
WANTED—By a sewer contractor having full season's work, man to take charge of tunnel work in shale rock. A2, care Municipal Journal & Engineer.

THE PITOMETER

ACCURATE—PORTABLE—ECONOMICAL

THE MOST EFFICIENT WASTE METER KNOWN

HAS LOCATED IN AMERICAN CITIES MANY MILLION GALLONS DAILY WASTE



Will accurately measure and record the flow of water in a pipe of any size from 4 inches to 16 feet in diameter under any pressure. All you need is a one-inch tap.

SLIP INDICATORS for Pumps.

PORTABLE TEST PITOMETERS for short tests with manual recorder.

PHOTO-RECORDING PITOMETERS with new prism attachment by which the highest accuracy is attained.

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